MEASUREMENT OF COST PRODUCTIVITY AND EFFICIENCY OF EDUCATION

STATE INSTITUTE OF EDUCATION
Govt. of West Bengal

Edited by
H. N. PANDIT

NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

The book on Measurement of Cost Productivity and Efficiency of Education presents papers by 32 eminent economists, econometricians and educational planners, contributed in the Seminar organised by the NCERT at Jaipur from 27th November to 2nd December, 1967. The book is divided into five sections, each devoted to a particular aspect of the theme.

Section I gives detailed taxonomy of educational costs, methodology for calculating unit costs of education, behaviour of cost functions and other related issues. It also gives an overall design of the NCERT project on 'A Study in Unit Cost at School Stage in India'.

Section II clarifies the theoretical aspects of internal efficiency in and external efficiency of educational system and also gives two interesting papers about the functional efficiency aspects of planning for construction of school buildings and for lighting of teaching spaces.

Section III describes the economic criteria for educational decision making, similarities and dissimilarities between educational and industrial processes, models for optimum allocation of resources in education and usefulness of rate of return criterion for educational planning.

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FOREWORD

The National Council of Educational Research and Training organised a Seminar at Jaipur towards the end of 1967 to discuss major issues in the Measurement of Cost Productivity and Efficiency of Education. The present volume is a collection of papers presented at the Seminar by economists, econometricians, educational planners and administrators.

The papers have been presented in five sections each devoted to a particular aspect. Section I gives papers dealing with conceptual aspects of costing of education and empirical investigations. The authors of these papers have discussed the issues for identifying the components of educational cost, and the causal relationship between various elements of cost and productivity of educational institutions. This section begins with a paper giving an overall design of the NCERT research project on ' A Study in Unit Cost at School Stage in India '. It gives theoretical, empirical and organisational aspects of the project which the NCERT had proposed to take-up in collaboration with State Governments and other institutions. Papers in Section II discuss conceptual and empirical issues which arise in determining the internal and functional efficiency of investment in educational institutions. One of the papers in this Section discusses the possibilities of cost reduction in primary schools by adopting alternative models of school buildings as evolved by the Central Building Research Institute. The findings in the paper suggest for a 40 per cent reduction in the construction cost of school building if anyone of the schemes in the paper is accepted. Papers in Section III present rationale and approach for investment strategies in the field of education. How the economic optimization technique can be applied to the problems of educational industry forms a major theme of discussions in the Section. Papers in Section IV deal with problems of productivity of education and policy issues. One of the papers in the Section deals with significance of the role of education in the agricultural productivity. Finally, Section V contains papers which review the literature dealing with the problems in the measuring of cost-benefits of education. One of the two papers makes a comprehensive survey of literature on evaluation of educational projects and attempts to clarify issues which are relevant for educational project planning and evaluation.

In this volume one will find some useful thinking on major issues in the field of economics of education and educational planning with special reference to the Indian situation. I hope that this book will be read with interest and the ideas here may initiate research and systematic study of many complex problems of Indian education.

1 October 1969
New Delhi

SHIB K. MITRA
Joint Director, NCERT

PREFACE

The Economics of Education Unit of the Department of Foundations of Education, National Institute of Education, NCERT organized a seminar on 'Measurement of Cost Productivity and Efficiency of Education', at Jaipur from 27 November to 2 December 1967. Professional economists, econometricians and educationists were invited to the seminar from departments of Indian Universities, professional organizations and Central and State Governments. In all 39 participants participated in the deliberations of the seminar. The seminar was organized by the Department to identify major issues involved in a study of unit costs of education and educational productivity. It is gratifying to note that it has been possible for the first time in India to organize discussions by different subject-specialists on major issues, basic to the planning of education at different levels. Shri H. N. Pandit, Reader, Economics of Education was the Director of the Seminar and was mainly responsible for it. The report prepared by him gives the papers presented, issues raised and concepts finalized during the course of the seminar. The recommendations of the participants are also given in the report.

I would like to express our thanks to all the participants who have contributed papers for the Seminar. The Department is highly indebted to Prof. M. V. Mathur, then Vice-Chancellor, Rajasthan University and President of the Indian Economic Association for extending his kind cooperation in making the Seminar a success. The Department is also indebted to Prof. Raj Krishna, Chairman and Members of the Steering Committee and Rapporteurs for planning and recording the proceedings of the Seminar.

It is hoped that the publication of this volume will prove a useful addition to the existing literature on the Economics of Education.

J. K. Shukla
Head, Department
of Foundations of Education

6 September 1968
New Delhi

ACKNOWLEDGEMENTS

I am extremely thankful for the valuable cooperation given to me by the eminent economists, econometricians and educationists by their contributing very useful papers for the Seminar on 'Measurement of Cost Productivity and Efficiency of Education'. In particular, I wish to express my heart-felt gratitude to Prof. M. V. Mathur, then President of the Indian Economic Association and Vice-Chancellor, Rajasthan University for extending all possible guidance and cooperation in making the seminar a success. I am also grateful to Prof. Shib K. Mitra, Joint Director, NCERT and Prof. S. N. Mukerjee, then Head of the Department for the inspiration, valuable cooperation and guidance, I received from them. Without the valuable guidance of Prof. Raj Krishna and members of the Steering Committee for the Seminar, it would have been almost impossible to organize the discussions in a systematic manner and to crystallize discussions on specific issues during the course of the seminar. I recall with great pleasure the most energetic cooperation of the participants and the rapporteurs for the deliberations and the systematic recording of the proceedings of the seminar. I am specially grateful to Prof. G. B. Kulkarni, Dr. V. R. Panchamukhi, Dr. P. D. Hajela, Dr. (Miss) I. Z. Hussain, Prof. D. A. Dabholkar and Prof. P. C. Malhotra for presiding over the different sessions of the Seminar. I am also grateful to my colleagues Shri Ramesh Chandra and Shri Harbhajan Singh Bajaj for extending necessary assistance. My special thanks are also due to Shri D. Raghvan, Head, Publications Unit for his cooperation. Finally, I am grateful to Miss Sushma Kumari for typing out several times, manuscripts for the final publication of the Seminar volume. In the end, I wish to express my gratitude to Prof. J. K. Shukla for encouraging me in completing the work relating to the preparation of the overall report of the seminar. In editing this report, Prof. Shukla has been a constant source of guidance and help to me.

The views expressed in the report are those of the individual contributors and not of the NCERT or the organizations, where they are employed.

5 September 1968
New Delhi

H. N. Pandit
Reader,
Economics of Education,
National Institute of Education

EDITOR'S REPORT

Participating Organizations

The Unit on Economics of Education in the Department of Foundations of Education has undertaken a detailed project entitled 'A Study in Unit Costs at School Stage in India', under the Internal Cooperative Research Programme of the U.S. Office of Education, Department of Health, Education and Welfare. This is one of the major research projects of the NCERT. The major aims of the project are to estimate the unit costs of education at school stage in India (units of measurement considered for this purpose are of three types, namely: a student, a class and an institution); to locate factors which cause variations in unit costs; and to study unit costs in relation to internal and external efficiency of school stage education in the country. It was felt that before undertaking such a study eminent economists, econometricians, educational planners and research workers should be invited to discuss issues involved to study the costs, productivity and efficiency of education. Therefore, a seminar on this subject was organized in the Humanities Block of the University of Rajasthan at Jaipur from 27 November to 2 December 1967. Leading specialists from the Departments of Economics of the Universities of Delhi, Allahabad, Lucknow, Bihar, Bombay, Baroda, Vallabh Vidyanagar, Osmania, Shantiniketan and Rajasthan; Indian Institute of Management, Calcutta; Institute of Applied Manpower Research; Planning Commission (Education Division); Asian Institute of Educational Planning and Administration; Ford Foundation; London School of Economics and Political Science; State Bank of India; Central Building Research Institute, Roorkee: College of Commerce, Sangli; Indian Statistical Institute, Calcutta; Sanatan Dharam College, Delhi; National Institute of Education; Ministry of Education and Tribal Research Institute, Mandla, attended the seminar. The names of the participants are given in the annexure.

Steering Committee

The seminar was inaugurated by Prof. M. V. Mathur, President, Indian Economic Association, Vice-Chancellor of Rajasthan University and formerly member of the Education Commission, on 27 November 1967. In order to organize a systematic presentation of papers and coordinate arrangement of the discussions in the seminar, a Steering Committee of specialists in economics, econometrics and education under the chairmanship of Prof. Raj Krishna was set up. Prof. G. B. Kulkarni, Dr. V. V. John, Principal P. C. Malhotra, Dr. P. D. Hajela, Dr. (Miss)

I. Z. Hussain, Dr. V. R. Panchamukhi and Shri H. N. Pandit were the members of the Committee. Organization of the Steering Committee is given in the Annexure. The Steering Committee met on 27 November 1967 and reviewed the material of the different papers contributed by the participants. The papers were classified into the following four broad subject groups:

a. Costs studies;

b. Productivity and efficiency of education;

c. Planning of investment in education and other policy issues; and

d. Cost-benefit analysis of education: Review of literature and methodology.

The proceedings were conducted in eight sessions. The Steering Committee met again on 29 November 1967 and took stock of the progress made in discussions and issues clarified in the first five sessions. Dr. Laxminarayan Sinha, Dr. R. K. Sau, Dr. V. R. Panchamukhi, Prof. Ruddar Datt and Dr. K. R. Shah were requested to prepare technical notes on specific issues for discussion and finalization in the subsequent sessions. The overall programme of discussion of the participants and of the Steering Committee was planned and coordinated by Shri H. N. Pandit, seminar director. Administrative activities of the seminar were coordinated by Shri Ramesh Chandra. A summary of the proceeding of the seminar is given in the subsequent sections.

Mechanics of Discussions

As mentioned earlier, the scheme for discussion of different papers was finalized by the Steering Committee and papers were presented by the participants strictly according to the scheme. The scheme involved that a participant should present his paper in brief and list the main issues indentified in the paper. The issues raised by the different participants during the session were summarized by the Chairman of the session and those were thrown up for discussion by the participants. The record of the discussions was prepared by the rapporteurs. This was done for all the eight sessions and the rapporteurs' reports were coordinated by the seminar director. The seminar director presented a coordinated report of the rapporteurs, and technical notes prepared by the experts in the concluding session. The names of the Chairmen and rapporteurs for the different sessions are given below:

Area	*Name of the Chairman*	*Rapporteurs*
a. *Cost Studies*		
Session I	G. B. Kulkarni	1. J. H. Adhavaryu 2. D. A. Dabholkar
Session II	Miss I. Z. Hussain	1. Ruddar Datt 2. Q. U. Khan
Session III	V. R. Panchamukhi	1. M. S. Ramanujam 2. Miss I. Z. Hussain
b. *Productivity and Efficiency of Education*		
Session IV	Laxminarayan Sinha	1. T. S. Papola 2. M. S. Prakasa Rao
c. *Planning of Investment in Education and other Policy issues*		
Session V	P. C. Malhotra	B. Dey
Session VI	Raj Krishna	1. P. R. Panchamukhi 2. D. L. Sharma
Session VII	V. V. John	H. Venkateswara
d. *Benefit-Cost Analysis of Education: Review of Literature and Methodology*		
Session VIII	P. D. Hajela	1. P. R. Panchamukhi 2. K. R. Shah

Main Issues Raised for Discussion

During the course of discussion numerous issues were raised but we present here briefly some of the more important issues only. These include:

What are the objectives of education at various levels? Is the objective maximization of output or minimization of cost? How to differentiate between educational facilities and educational output?

If the objectives of education at various levels are given, the next task is to translate the objectives in terms of the units of output as the cost of the sub-system varies with the unit selected. The alternatives suggested in this regard are whether it be: (*a*) the completers of education, or (*b*) school attendance or, (*c*) functional literacy and what weights should be given to the drop-outs in adjusting the output.

How to standardize the quality of output? What are the variables affecting the quality of output? How far do the qualifications of a teacher, the mode of instruction, the teacher-pupil ratio and other facilities like the library and building space reflect upon the quality?

What should be the unit of measurement and what weights are to be given to each in judging the quality? How to define educational costs? What are various cost elements ?

Can there be an economic classification of costs? If so, what are its components?

If costs of education are divided into: (*a*) institutional costs, (*b*) student costs, and (*c*) opportunity cost, what should be the composition of these costs? What type of improvements in data are required in this respect?

While obtaining institutional cost, should we include only public expenditure or should we also include along with public expenditure the contribution made by private and semi-private bodies? How should expenditure on pensions and non-teaching staff be apportioned? Similarly, how can the apportionment of overhead expenditure among various levels be made?

Is it not necessary to make the cost data available by type and level of education?

How should cost data available at current prices be converted into constant prices?

Should we make a distinction between average cost per student and marginal cost per student?

What methodology should be adopted for isolating the cost of education at each level?

What is the precise definition of capital cost of education? Should the capital cost of building be charged on the basis of depreciation rate, or the rental value, or the replacement cost of the capital asset?

What are the causes of high cost of education in various institutions? Is it due to: (*a*) under utilization of physical and human capacities or (*b*) outmoded teaching methods, or (*c*) inability to retain students? What are the various possibilities of cost reduction in the design and construction of school buildings?

How can we measure the extent of wastage, particularly that is due to drop-outs? Is it possible to construct an index of stagnation?

What are the costs and efficiency of formal *versus* informal education or on-the-job training? How far can we make adjustments in the cost of formal education? What is the relevance of choice of: (*a*) age of school entry, and (*b*) size of an institution to cost of education?

How can we achieve optimum allocation of resources between professional and technical education and general education?

How to convert the stock of educational inputs into flow inputs?

How to standardize the output of the educational institutions?

What are the problems involved in inter-institutional and inter-regional comparison of unit costs of education?

How far we can utilize the concepts of ' use-efficiency ' and ' economic-efficiency ' in relation to education industry?

How to identify and measure the direct and indirect benefits of educational projects. What is the impact of educational expenditure on the relative price structure in the economy and its consequences for the measurement of benefit-cost ratios?

Whether the benefit-cost calculations should be undertaken from the point of view of: (*a*) an individual, or (*b*) an institution, or (*c*) the society as a whole. What is the place for economic concepts like opportunity cost in benefit-cost analysis.

How far and to what extent can operations research, systems analysis, cost-benefit analysis and manpower approach be applied to the formulation of educational plans?

If education is treated as an industry, some of the questions posed are, such as,

a. Can expenditure of education in all forms be compared to those of an industry?

b. Are the immediate consumption effects of education not more disturbing than satisfying?

c. Are the immediate effects of education on saving not more disturbing than satisfying?

d. How can investment in education be called anti-cyclical when during recession or depression cuts in expenditure are first applied to education.

What is the role of research in reducing the costs of education and in correcting the imbalances in the employment market for education.

ISSUES CLARIFIED

Issues listed in the above section and overall design of the NIE Cost Project were taken up for detailed discussions and general views emerging out of these discussions about the different items are given below:

Standardization of Output and Inputs of Education

On the issue of cost analysis of education a view emerged in the seminar that output be measured in terms of a unit free from any imputation of earnings which the product (person) may command in the market. The unit has to be defined in terms of certain depth of knowledge per pupil year weighted with certain physical and moral characteristics. It was further felt that a composite index for standardization of output should be worked out. The variates relevant to the formulation of such an index should be identified and appropriate weights should be given to each variate. After standardization of output, it was essential to develop the concept of a standardized institution which can serve as a basis for comparison. On the other hand, the inputs have to be calculated in terms of facilities available and utilized, such as man hours of teaching done, buildings, libraries, laboratories, etc., used, each of these items also weighted with regard to their qualities. Sources from which inputs flow may then be isolated and broadly divided as inputs contributed by students and those contibuted by other than students.

Earnings foregone by children attending schools are relevant from the point of view of families actually deprived of such earnings. There may be such families in low income groups in particular occupations such as crop-sharing tenants in fertile agricultural tracts. Institutions which have their capacities partly unutilized on account of such opportunity cost of education to parents may take it into account in order to arrange for full utilization of their capacities. For society and for parents generally the disutility of keeping children illiterate is greater than any opportunity cost of education of children.

Unit cost of education is the sum of student inputs (inputs contributed by students) and institutional inputs (those contributed by institutions) per unit of output (pupil-years) as defined.

Unit cost may be calculated for a unit course of study and then for an institution running several course units. Comparison of unit cost of different institutions in each area may indicate the optimum size of the institution for each region. Unit cost of the institution of optimum size may be taken as norm and efficiency of other institutions of the region may be assessed by comparison of unit cost of these with this norm.

Educational Output and Norms of Cost for the Production of this Output

This involves the computation of cost per pupil year in a certain course of the output of a standard quality. This further, involves the determination of the density of human and physical inputs required for producing a standard output. In this way a concept of normative cost should be developed. But the concept of normative cost and actual cost are not mutually exclusive. The planner needs both for decision-making. Input-output ratios of standard institutions worked out at various levels can serve as norms for future educational policy.

Conversion of Stock-inputs into Flow-inputs

Another problem was to convert the stock-inputs into flow-inputs. For this, it was felt that either a concept of depreciation or the rental value of the asset or the replacement cost of assets be used. It was not possible to reach an agreement whether book value of the asset or the income tax department norms of depreciation or some other basis can be used as the basis of calculations. The problem was real and it was essential to further investigate it.

The Problem of Estimating Wastage in Education

Wastage in education is represented by the drop-outs and stagnation. So far calculations of wastage have been based on the assumption that the system should develop on the basis of 100 per cent efficiency. But it was felt that a critical minimum wastage depending on the genetic and psychological characteristics of the student population was unavoidable. Consequently, this critical minimum wastage level has to be deducted out of the ' actual wastage level ' so as to get what may be described as ' Avoidable Wastage '.

Wastage studies should be conducted from the personal point of view, institutional point of view, level of education point of view and the social point of view. Such studies can help a great deal in framing a policy towards the attainment of a minimum level of standardized output at different levels.

Further, it was felt that a marginal doze of additional expenditure injected into the educational system by the Government can help to reduce wastage even in the privately managed sector of the educational establishment.

Opportunity Cost

On the question of inclusion of opportunity costs, it was felt that the concept was important and the calculation of opportunity cost was essential for a knowledge of the internal efficiency of the system. However, it was not necessary to include such costs while computing total social costs of education to the whole economy. Case studies should be undertaken in this respect. Some of the points emerging from the discussion of some of the participants on this issue are also presented here.

Opportunity cost is a much wider concept and includes transfer cost which in the case of education would mean the earnings foregone by students by taking to education instead of going in for employment. To what extent is the concept of ' opportunity cost ' valid in a country like India? In the present phase of its ' under-development ', the country carries a large burden of under-employment. In such circumstances are we justified in arguing any transfer earnings to young men of working age who choose to go to schools instead of joining the vast multitude of unemployed people?

Individually each of these entrants may reckon the full earnings foregone as a cost but socially the earning foregone may be zero. Of course, here one has to make allowance for the factor of education.

As a person adds on to his educational qualifications, both his chances of joining employment and the likely emoluments increase. And this might happen without at the same time ruining some one else's prospects. This should be the case to the extent that the educated and skilled people fall into a non-competing group distinct from the group comprising of unskilled workers. Thus arises the question: at what *level* of different types of education does a person pass on from one group to another to be assigned a positive transfer earning? How much would this transfer earning be? Would it be as high as full private wage foregone or less?

The questions posed above show how much more problematic it is to calculate opportunity cost of education in India than, say, in the U.S.A.

The main problem in the U.S.A. and other industrially advanced societies in calculating the income foregone of students is to provide for the short-term unemployment that they might experience from time to time. From the long run point of view, they can and do assume full employment. But in an underdeveloped economy where a reasonably long period of, say, 25 years, does not hold out a prospect of full employment, the social cost of keeping young people in schools rather than in a job cannot be anything but negligible.

Concept of Private Costs in Education

A consensus emerged that private costs in education should be determined. Even the cost of maintenance should be computed in cases of students whose parents fall in the income category of less than Rs. 3,000 per annum. The purpose of computing such costs is to devise ways and means towards the attainment of equality of educational opportunity. It is necessary to identify components and evolve classification and measurement scheme for studying private costs. Information on non-tuition private cost items like, books, stationery, equipment, lodging and boarding, transport and refreshments should be collected.

The Need for Developing a Standard Economic Classification of Educational Expenditure

It was pointed out that as the educational statistics collected so far in this country were based on administrative considerations, these were deficient in content for making a proper analysis of costs of education. It was, therefore, essential to examine the need for developing a Standard Economic Classification of Educational Expenditure so that the schedules for collection of educational statistics can be reframed accordingly.

It was felt that educational statistics relating to costs were discussed on current prices and these should be adjusted so as to make inter-temporal comparison. For this purpose, the cost of living index should be used to deflate the salary component of cost of education and building materials index for deflating the physical cost component of education.

Relation of Education Level and Productivity in Different Sectors of the Economy

The relationship of educational level with the productivity of the agricultural sector has been established. It was, however, felt that studies may be conducted to determine whether such a relationship exists in other sectors of the economy. Such studies can be of immense benefit in persuading the planners in this country to devote more resources to education, as also to impress upon the planner the undesirability of applying larger cuts whenever the total plan size is pruned. It was felt that the allocations to education were cut on a more than proportionate basis *vis-a-vis* other sectors of the economy whenever plan-size was reduced.

Rate of Return Approach, Benefit-Cost Approach and the Manpower Approach

The nature of the rate of returns approach was considered similar to that of benefit-cost approach. If the rate of return approach is viewed in a broader perspective, one can identify it as a benefit-cost approach. It was felt that the return-cost ratio (or benefit-cost ratios) should be distinguished at these levels:

i. From the individual's point of view wherein the public expenditure need not be considered.
ii. From the point of view of a single institution or a project.
iii. From the point of view of the entire public policy.

A view emerged that the return-cost ratios are indicative of a symptom, but the manpower approach has to help in determining the magnitudes of outputs required for different occupations over a period of time.

A view also emerged out of the seminar discussions that all expenditure in education cannot be classified as investment. So it was necessary to identify the consumption component of educational expenditure and adjust the return-cost ratios from the point of view of public policy at various levels of education.

RECOMMENDATIONS

There was a consensus among the participants about the following recommendations:

It is recommended that we should try to combine the use of various tools which the economics science has so far placed at our disposal, such as, cost-benefit analysis, manpower approach and operations research. Models should be developed and estimated in which simultaneous use is made of manpower projections made by manpower economists, and data on costs, returns, wastage, standard output, etc., collected in special studies so that a firm quantitative basis for educational planning and the allocation of educational expenditure is available.

The utility of these tools in the Indian context will have to be examined in the light of the data available to us and steps will have to be taken to improve the present collection and classification of data. The NCERT should give a lead in organizing this.

It is felt that the definition and measurement of concepts such as the following would be useful if applied within certain limits:

a. Standardization of output.
b. Standardization of cost.
c. Measurement of opportunity cost.

The NCERT may set up workshops to examine how and to what extent we can make use of such concepts.

Our main aims should be to orient the work in this field towards yielding results which would be practically useful for policy making. The NCERT Project entitled *A Study in Unit Cost at School Stage in India* as planned by the NCERT would become very useful in the context. The seminar feels that it would be useful to calculate unit costs in respect of the following:

a. Per student enrolled as well as fully trained.
b. Per student for different types of courses.
c. Per student for various institutions.
d. Per student cost in a society.

Detailed studies will have to be made regarding these costs on the basis of a careful consideration of the various items to be included.

It would be useful to try to arrive at a concept of what might be called an institution of optimum, standard or representative size. This may help us to judge the efficiency of present institutions and also enable us to suggest future planning of such institutions. In order to be able to do this the following things would be necessary: (*i*) educationists will have to give careful thought to the idea of what might be called a good institution; (*ii*) empirical studies will have to be carried out in relation to the institutions which are at present generally considered to be good institutions; (*iii*) it may be worth while considering the setting up of such experimental institutions in the field of primary education and secondary education.

Along with the present unit cost project, studies will have to be carried out for the various ways in which the unit costs can be reduced without adversely affecting the level of efficiency. For this, experienced educationists and economists will have to discuss the problem thoroughly in small workshops and some case studies may also have to be undertaken.

Estimate should be made of the private costs of education borne by the students and their parents. Such studies are very essential to determine the degree of inequalities of educational opportunities as it obtains at present and may indicate ways in which such inequalities can be effectively reduced.

The application of economic efficiency approach to educational planning in India is very useful because of the deficiency in collection and compilation of reliable data. Where some of the concepts of costs (opportunity costs) are not applicable, it will be useful to study internal and external efficiency of educational institutions by undertaking further studies to clarify methodological issues involved in application of this approach to educational planning at micro and macro levels.

It is desirable to initiate studies on space utilization, functional efficiency and cost of construction of some typical existing school buildings by taking all available help from the experts now available in the C.B.R.I. where such studies are in progress.

It is therefore recommended that to make studies of cost reduction in school buildings more effective and useful, it will be necessary that economists, educational planners as well as research workers connected with design and functional efficiency of buildings collaborate in conducting studies in this area.

The study of the educational system in India is not in fact one single study but a complex of a whole group of studies. The nature of the problem would vary not only from one level of education to another but would vary from state to state or even in the same state it may vary for different areas or for different institutions catering to different groups of students. The study of the problem will not be adequate unless detailed studies in respect of all such groups are made. Even at present some such studies are carried out by the NCERT. It would however, be advisable to have a wider spread of such pilot studies in different States. After the studies are made, the workshops or seminars may discuss the details of these studies and suggest a uniform pattern of investigation for the whole country as far as possible.

In all these studies active and effective cooperation from the economists, statisticians and econometricians should be sought and would be very useful.

EXTRACTS FROM THE INAUGURAL ADDRESS

The seminar was inaugurated by Prof. M. V. Mathur. Shri H. N. Pandit, director of the seminar, welcomed Prof. M. V. Mathur, Vice-Chancellor and the participants of the seminar. He briefly outlined the aims and objectives of the seminar; and he mentioned the major problems in the area of Economics of Education that deserved a serious attention of both educationists and economists. Therefore, he entertained high expectations from the deliberations of the experts assembled at this seminar on the important issues of costs, productivity and efficiency of education.

In the course of his inaugural address, Prof. M. V. Mathur, apart from commending the organization of the seminar for discussing the specified technical and complicated issues gave a sense of direction to the seminar and defined the objectives and the purpose of the assembled experts and specialists *vis-a-vis* educational expansion for development at present underway in India. He stressed the need for taking stock of currently available educational information and research material with a view to accelerating the pace of national development. He cited in this context the measures adopted in advanced countries since the Second World War and the interest evinced by the World Bank and UNESCO in the form of setting up a unit in each of them to conduct research in economics of education. In particular, he emphasised the need for taking up studies in the field of costs of education at various stages and levels. He also invited the participants to focus their attention on various issues like the age of school entry, optimum size of an institution, pupil-teacher ratio, general education *vs.*, professional and technical education, etc. He gave an instance of the importance of the age of entry into formal schools by referring to the attention and care bestowed on kindergarten schools in the USSR on the ground that that is the period when the child's behavioural pattern is determined for life. He administered a gentle warning that while emphasising the quantitative aspect of education in the course of economic development, the equally important and perhaps more important the qualitative aspect should not be ignored. At this juncture, he recommended the establishment of special institutions for talented and gifted children. He argued that nothing undemocratic could be associated with such a move and cited the example of arch-socialistic countries like the USSR which set up such special institutions to foster and promote talent. It is for the experts of the seminar to devise scientific institutions suitable under Indian conditions, he emphasised. Prof. Mathur remarked that large expansion in higher education in this country was at the expense of quality. In this regard he expressed his dissatisfaction at wide variation in the efficiency of similar institutions in different regions and sectors, while he found hardly any rational relationship between the costs incurred by them and the quality of their outputs. In this connection, he drew pointed attention to the difference both in costs and in efficiency of engineering Institutions affiliated to the universities, and State Colleges of engineering and the regional colleges of engineering and Indian Institutes of Technology. Such costs differentials divorced from product differentials require, Prof. Mathur declared, a careful study of the experts assembled for the seminar.

Proceeding to the allocations for education he expressed dissatisfaction with the cuts often applied to expenditure in this vital sector both at the Central and State levels. These cuts are, according to him, deplorable for the reason that they usually result in the axing of quality schemes of education. Happily for the nation, Prof. Mathur reminded the participants that new schedule of priorities—food, family planning and education—denotes a favourable turn in social policy as it is stated in the Fourth Five-Year Plan (draft). Therefore, he rightly hoped that quality schemes of education would no longer be casualties in misdirected economies in educational expenditure. At the same time, Prof. Mathur insisted that financing of education at all levels should be efficiency oriented. He, in fact suggested that the NCERT and the UGC would do well to set up working groups and research units and centres of advanced learning to undertake research in this important area. In conclusion, Prof. Mathur commended the timing of the seminar for he felt that the pause in planning is ideal for reviewing past achievements and project the future course of action in education on a scientific basis. He wound up by wishing a success to the deliberations of the specialists and hoped the findings of the seminar would be useful in the study on unit costs planned by the NCERT. Shri H. N. Pandit offered a hearty vote of thanks to the Vice-Chancellor and participants in the seminar.

Annexure

STEERING COMMITTEE

1. Dr. Raj Krishna, Professor of Economics, Department of Economics, University of Rajasthan, Jaipur.	*Chairman*
2. Shri G. B. Kulkarni, Economic Adviser, State Bank of India, Chairman, Board of Studies in Commerce, Bombay University, and Hon. Secretary, Indian Society of Agricultural Economics, Bombay.	*Member*
3. Dr. V. V. John, Ex-Director, Directorate of Public Instruction, Rajasthan.	*Member*
4. Prof. P. C. Malhotra, Principal, Hamedia College, Bhopal.	*Member*
5. Dr. V. R. Panchamukhi, Senior Research Officer, Department of Economics, Bombay.	*Member*
6. Dr. P. D. Hajela, Reader, Department of Economics, Allahabad.	*Member*
7. Dr. (Miss) I. Z. Hussain, Joint Director, Department of Economics, Lucknow University, Lucknow.	*Member*
8. Shri H. N. Pandit, Reader, Economics of Education, National Institute of Education, New Delhi.	*Member Secretary* *and* *Seminar Director*

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University of Rajasthan, Jaipur.
(Formerly Member, Education Commission)

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University of Rajasthan, Jaipur.

3. Prof. G. B. Kulkarni,
Economic Adviser,
State Bank of India, Bombay.

4. Dr. V. V. John,
Ex-Director,
Directorate of Public Instruction,
Rajasthan.

5. Prof. P. C. Malhotra,
Ex-Principal, Hamedia College,
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Note. Prof. A. R. Kamat, Prof. P. R. Brahmananda, Prof. Gautam Mathur and Dr. R. C. Sharma could not attend the seminar.

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Section I

Methodology for Costing of Education and Empirical Studies

The papers in this section deal with the conceptual framework of costing of education and empirical investigations. The authors have tried to indicate issues involved in the identification of elements of educational cost and the causal relationships of various cost elements with productivity of educational institutions.

H. N. Pandit's paper *A Study in Unit Costs at School Stage in India: A Design of the Research Project* gives an overall summary of issues involved in selecting items of costs, unit for measurement and indices for measuring the quality of output. He also presents organizational aspects of the research project as envisaged by the NCERT.

B. Dey in his paper *Costing of Education* tries to show the extent to which cost concepts relevant to manufacturing industries can be applied to educational industry. He broadly classifies the educational costs into four categories: (i) direct expenditure, (ii) expenditure for meals and tiffins, (iii) expenditure of students' health service, and (iv) expenditure on training of teachers. He also gives empirical content to his cost classification scheme with the help of the data collected through a pilot enquiry of public health and educational services in Madhyam Gram, an urbanized village in the district of twenty-four parganas, West Bengal, for 1963.

D. L. Sharma's paper *Unit Costs of Education—Our knowledge, Gaps and Needs* points out the major gaps in coverage, collection and methodology of educational statistics relating to costs in India. He also gives a technique for estimating unit cost of education and tries to locate the extent of wastage of resources on account of drop-outs and stagnation. Finally, he suggests measures for improving the present method of collection of cost data by the government agencies in the country. Taxonomy of costs is given in the Appendix 1 of the paper.

Gurbax Singh in his paper *Concepts in, and Methodology of, Measuring Unit Costs of Education* points out the possible duplication of double counting of fees and scholarship. He explains how the private cost can be duplicated, if expenditure at parent's end and that at the educational-institution's end are both taken into account. He also raises certain questions regarding valuation of cost of scholarship in the computation of unit cost. He further presents taxonomy of unit costs.

H. Venkateswara Rao in his paper *Educational Costs: Concepts and Issues* emphasizes the importance of the economic aspects of education and highlights a number of approaches for including investment in education in an economic analysis. All the five papers present almost identical cost clarification schemes for estimating unit cost of education.

K. R. Shah in his first paper *Private Cost of Elementary Education* emphasizes the importance of non-tuition expenditure and tries to explain that fees are not considered as a burden by the relatively affluent parents. His study reveals that non-tuition expenditure is usually low in case of children coming from poorer families.

K. R. Shah in his second paper *Expenditure on Professional School Education in India 1950–51 to 1960–61* surveys trends in investment expenditure in professional education during the first two Five Year Plans. His investigation reveals that there was comparatively a slower shift in secondary education from general to vocational education. This conclusion was examined by him in relation to international trends in the allocations of direct educational expenditure and enrolments between professional and non-professional school education during the period. In the appendix to his paper he has tried to find out the progress of direct expenditure on this component of education at constant prices. He concludes from his exercise that educational expenditure at constant prices increased only 131·4 per cent as against 209·2 per cent at current prices during the decade. It is even more interesting that he shows an excess capacity in terms of teaching manpower at this level of education.

Ruddar Datt in his paper *The Unit Costs of Education—A Case Study of Haryana Colleges* makes a clear distinction between cost of creation of a seat and cost of operating it. While presenting his figures for selected colleges in Haryana State, he studies variations in unit cost in relation to age of the college, size of the college (in terms of enrolment), average pay of teachers and teacher cost versus non-teacher cost. He has made a separate study of private and government colleges. He has also investigated the role of fee income in the financing of unit cost of education.

G. B. Kulkarni in his paper *Unit Costs of Education in Commerce Colleges of Bombay* studies unit costs for a period of five years (1962 to 1966). His study reveals that unit cost at current prices had increased from Rs. 316 to Rs. 453 during the period. It also shows that the pupil-teacher ratio went down from 33 : 1 to 25 : 1. It is indeed revealing that despite the decreasing trend in the pupil-teacher ratio, many of the teachers in the commerce colleges were leaving the profession. He explains this phenomenon by the increase in the emoluments in alternative jobs, available elsewhere. He also found an increase in the work load of teachers during the period.

Chapter One

A Study in Unit Costs at the School Stage in India: A Design of the Research Project

H. N. Pandit*

The Department of Foundations of Education is one of the youngest departments of the National Institute of Education in the National Council of Educational Research and Training. A Unit on Economics of Education is located in the Department. The main aim of the Unit is to conduct depth studies and intensive training programmes in the broad field of economics of education. In this connection, a monograph on *Plan of Studies in Economics of Education* was prepared and circulated for comments and suggestion. Many useful comments have been received from distinguished Indian and foreign experts working in the field. In the light of these suggestions, the Unit is now developing strong research programmes. Material thus generated is believed to go a long way in improving the knowledge about the growing problems in the field of economics of education.

The Unit has planned a research project entitled *A Study in Unit Costs at School Stage in India.* This constituted as one of the major research projects undertaken by the National Institute of Education under the International Cooperative Research Programme of the U. S. Office of Education, Department of Health, Education and Welfare. Now the project is being developed in the Department in collaboration with agencies like State Institutes of Education and Directorates of Public Instruction. The major aims of the project are:

—To estimate the unit cost of education at the school stage in India. The units for purposes of measurement are of three types: (*a*) student, (*b*) class, and (*c*) institution;

—To locate factors which cause variations in the unit costs; and

—To study unit cost in relation to the 'internal and external efficiency' of school stage educational system.

In order to take up this and similar studies, it is imperative to evolve a methodology regarding the measurement of cost, productivity and efficiency of education. Therefore a Seminar on *Measurement of Cost Productivity and Efficiency of Education* was organized at Jaipur from 27 November to 2 December 1967 to provide a frame for research in that direction. Here, in the subsequent paragraphs, details of the proposal are spelt out.

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*The author is highly thankful to Prof. S. N. Mukerji, Prof. J. K. Shukla, Dr. Philip H. Coombs, Dr. J. Hallak, Prof. M. V. Mathur, Prof. Raj Krishna, Prof. Eugene Staley, Mr. George Tobias, Prof. A. K. Sen, Dr. Andre Daniere, Dr. J. N. Sinha, Mr. D. P. Nayar and Dr. S. N. Saraf for many useful suggestions on the original (draft) proposal for the project.

THE PROBLEM : SCOPE AND COVERAGE

The national educational expenditure has been increasing rapidly during the last three Five Year Plan periods. It was only Rs. 114 crores in 1950-51 and rose to Rs. 600 crores in 1965–66. In terms of proportion of national income, it has increased from 1·2 per cent to 2·9 per cent during the same period. The per capita educational expenditure has registered even faster increase from Rs. 3·2 to Rs. 12·1 during the period under discussion. Further, the Education Commission in the Report on *Education and National Development*, (1964–66), projected the size and structure of the national educational expenditure during the next two decades. These projections are based on the possible growth in population, enrolment and GNP. The expenditure is expected to rise to Rs. 1,556 crores in 1975–76 and to Rs. 4,036 crores in 1985–86 (at 1965–66 prices). These statistical indices point out that the ' knowledge industry ' is going to be one of the major industries of the country and will demand greater and greater share from the limited national investment funds. At present most of the Indian States are spending a little over one-fifth of their budgets on the development of education in their respective States. The Central Government is also spending 3·4 per cent of the budget on different schemes. Obviously, the question arises whether the Central and State Governments can maintain the rising trend in these proportions without jeopardizing the implementation of objectives in other sectors for which they are equally responsible. Therefore, educational planners and administrators have to find out and evolve the techniques for lowering cost of input factors or increase the productivity of given inputs. Hence, the present study is aimed to demonstrate how the educational objectives can be achieved with less effort or how more things can be done with same effort. Findings of the study might ultimately lead to big economies and have a decisive effect on the further development of education not only in India but also in other developing countries.

A Fresh Field

Present knowledge about the investment trends in the field of education in the country is grossly inadequate. The published and unpublished data available on cost of education are not only inadequate in coverage but the data have not been collected on the basis of sound concepts of economics. Therefore, the analytical significance of the present information is quite limited. In this connection, we may mention here that Prof. M. V. Mathur completed a detailed project entitled *A Study in Costs of Education in India*, 1950–60 in 1966. Even this study did not provide information about major components of cost, namely, instructional cost, administrative cost, laboratory and equipment cost, building cost, cost of books and stationery and maintenance cost of students in approved hostels. Further, to-date no systematic attempt has been made to estimate the unit cost of education at the school stage in the country. This sector of education consumes a little over three-fourth of the total current expenditure on education. Even the unit cost studies conducted for the Education Commission in respect of higher education suffered from a number of weeknesses. Concepts and methodological aspects of these studies differed and comparisons of the findings of these studies could not be made. Realizing the importance of the research in this area, the Education Commission recommended for studies on unit costs and educational productivity. Relevant material from the Report is produced below:

> '. . . there is urgent need to examine continually the relationship between cost and quality and develop programmes which would obtain the highest possible quality for a given level of input (or minimize inputs for a given level of quality). We recommend that that UGC should provide financial support for the development of such studies in few selected Universities and that a similar programme for the school stage should be developed in the NCERT and the State Institutes of Education ' (p. 487).

Hence, the scope of study is limited to the *school stage of education only*. In other words, unit cost will be studied in respect of primary schools; middle schools; high schools; higher secondary schools and three other closely related categories of institutions: teacher-training schools; teacher-training colleges and industrial training institutions. Further, the units for measurement of costs will be of three types: (*a*) *student* as a unit, (*b*) *class* as a unit, and (*c*) *institution* as a unit. Unit cost of education will be attempted, among others, according to management (Government, local-body, private aided or unaided), location (urban or rural), sex (boys or girls) and size and types of institution. These aspects will be studied according to different geographical areas in the country. In due course, the unit costs will be utilized for studying the internal and external efficiency of educational institutions.

THEORETICAL FRAME WORK

Economists after the World War II have developed a strong interest in the development of the theory of human capital on lines similar to the theory of physical capital. Activities like education, health and welfare have now been recognized to possess investment component because these enhance the 'acquired and useful attitudes of life'. Despite the vigorous attempts of the economists it has not been possible to measure precisely the output of these activities. In order to rationalize the investment strategies in the field of education, it becomes exceedingly important to identify and measure the inputs and outputs of the educational system. Similar to the field of industry, decisions in education have to be derived from the benefit-cost ratios. Therefore, the output side of the educational process has to be clarified and we have to learn more and more about the internal and external efficiencies of the process. Such a study may be very useful for evolving long-term investment strategies in the field of education in the country.*

Like any industrial process, it is interesting to know the inputs and outputs and their inter-relationships in the field of education. For analytical purposes, which is supported by the working of the system, the production and distribution of knowledge have been treated like those of an industrial process. This implies that the 'brain power industry' can be analysed in terms of costs, productivity and efficiency usually associated with an industrial process. In this regard we may define the national education industry as a complex of educational institutions, physical equipment, pupils, teachers and management. This industry is dependent on the flow of money from the national and state incomes in the form of public and private contributions to the educational finance. Management of this industry consists of the Ministry and Departments of Education, Boards of Management, Directors of Public Instruction and Governing Bodies of educational societies. The professional, sub-professional and technical-manpower employed in the educational process consists of teachers and administrators. The raw materials for this industry are obviously the students. Other inputs of the educational plant are the buildings, libraries and laboratory equipment. The 'value added' by the process may be defined as the amount of knowledge absorbed and capabilities developed by the pupils when they come out of the process. Further, input-output analysis in the field of education may suggest for a deeper study of 'internal

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*Further, for various types of investment strategies special reference may be made to J. P. Naik's *Education in Fourth Plan*, Bombay, Nachiketa Publications, 1968. There is an urgent need to give empirical content to these strategies.

efficiency ' in the form of reduction in student wastage, effective utilization of teachers, school buildings and equipment, students' time and ' external efficiency ' in the form of market demand and supply aspects of the educational output. Such a study may also help us to find out the relationship between quality of education and student wastage. Since the educational process resembles the industrial process, analysis for reprocessing of ' drop-outs ' (a by-product) may lead to the maximization of final output from a given input. Units of measurement in the case of this industry can be thought of three types: institution as a unit, class as a unit and student as a unit. The knowledge industry also has import and export aspect in respect of its input factors and supplies of manpower.

Technical co-efficients of a process are theoretically measured as ratio of inputs and outputs. Here, we assume that the outputs can be measured. Since the educational process has been compared to an industrial process the inputs, as defined in the preceding paragraph, consist of investment and utilization of factors of production like buildings and equipment and teachers, and output is the number of pupils educated and trained. Productivity can, therefore, be calculated as output per unit of investment. But it is generally pointed out that it is difficult to identify and measure the quality of output of the educational process and the conditions under which it can be optimized. Therefore, the principal aim of *the present study is to evolve an index or joint index for quality of output and study the variations in the unit cost of education for different levels of quality.*

Analysis of cost of input factors is equally difficult as it is to measure the quality of educational output. This is so because the current information about cost of education is not only inadequate but is not collected on the basis of scientifically evolved concepts and definitions. For example, it is not possible with the help of currently available data to analyse costs so as to find out the smallest measurable element of the system that one wants to classify and compare to understand the causal relationship of input factors of the educational system or if one wants to find out the feasible and optimal combinations of inputs for producing a given unit of output. *Second task in the study, therefore, is to make a deeper analysis of cost of input factors.* It involves description of the phenomenon of the input factors and their level of utilization; classification and standardization of the elements of cost of inputs; and finally, identification of alternative combinations of inputs to achieve the educational goals. This type of analysis will be useful for rationalizing the investment strategies in the field of education. One point is to be borne in mind that the term ' cost ' has been used here in the economic sense and may not be taken as a substitute for the term ' expenditure ' as used in accounting terms. To clarify this point further, cost of education in a given number of years is the money value of inputs absorbed in producing a given unit of educational output in a given year. While the expenditure on education in a given year is the monetary value of the resources assigned during that year to the production of education, whatever the date at which the product will be made available. It is usually taken equal to the sum of all current disbursements on account of educational production. Since the economists are interested in measuring the cost of annual flow of inputs in the form of teachers, librarians, school administrators, depreciation, obsolescence and rent of school buildings and equipment and interest; the cost of education will not include, therefore, expenditure incurred on non-educational activities. Transfer incomes in the form of scholarships and other financial aids may not be included in costs. On the other hand, income 'foregone' by the students while they attend schools is to be included into cost calculations. However, we may caution here that that number and nature of the items of the cost will vary when it is to be calculated from the point of view of a student or his parent or institutional head or society as a whole. These aspects of cost are further clarified in the next section.

TAXONOMY OF UNIT COST OF EDUCATION

The cost of education in a given year mainly consists of the salaries of teaching and non-teaching staff; depreciation and interest of capital equipment in the form of buildings and teaching machines; rent of the land on which the institutions are sited; expenditure incurred on the purchase of textbooks, stationery and transportation services; boarding and lodging charges; opportunity cost of the time and effort of the students and value of the 'net leisure foregone' by the students and teachers (which equals to the value of excess number of hours enjoyed by a full-time worker of comparable status over them). These elements of cost can be further grouped into categories like teacher cost, administrative cost, initial and maintenance cost of institutions, books, tuition and transportation cost, opportunity cost, and other costs. These categories can further be grouped into private costs and social costs.

While calculating unit cost of education three major components of social cost of education are important. These are:

(*a*) institutional cost; (*b*) student cost; and (*c*) opportunity cost. A description of each component will help us in evolving techniques for measurement of different elements of cost and finally enable us to study their inter-relationships.

a. Institutional Cost

Institutional cost has four major components. These are:

(i) capital cost; (ii) equipment cost; (iii) non-divisible operating cost, and (iv) divisible operating cost. Items of cost included under each category are also given here:

i. *Capital Cost.* Items of expenditure included under this head are of non-recurring type. These include cost of land and buildings, laboratory, hospitals, water works, library, hostels, etc. *A proper assessment of cost of these items and annual depreciation is usually difficult and it is many times ignored in the educational cost calculations.*

ii. *Equipment Cost.* This component of cost includes an estimated value of services rendered by total stock of books in the library, equipment in the laboratory, gas plant and printing presses.

iii. *Non-divisible Operating Cost.* Items of expenditure under this head cannot be assigned to a particular class in an institution or a category of pupils in an institution. These include, salaries and allowances paid to administrative and establishment staff; gratuity, pension, provident fund contribution and salaries of teaching staff and library staff; expenditure on non-educational activities like magazines, NCC., hostels, social functions, hobby, workshops; rent, interest and administrative charges; taxes, electric and water charges; current repairs to buildings, furniture, contingent expenditure on postage, stationery, examinations, etc. *Here we have to develop criteria for allotment of expenditure on these items to different categories of pupils and different classes.*

iv. *Divisible Operating Cost.* Items of costs under this head include, teacher salaries; laboratory cost; examination cost; current expenditure on books and journals added to a library; scholarships and freeships paid. Difficulties arise over how to apportion the library cost between the teachers and students while calculating unit cost. *Again, whether transfer payments like scholarships and freeships should be included or not.*

b. Student Cost

Items of costs included here are, tuition and other fees, cost of books, equipment and stationery, 'extra cost of maintenance', *i.e.*, excess expenditure incurred in a hostel as compared to cost of maintenance at home and cost of clothing. *Items of expenditure like 'net leisure foregone' and 'income foregone' are also to be included under this head.* However, 'income foregone' is discussed under separate heading.

c. Opportunity Cost

This is an important component of educational costs. 'Opportunity cost' or 'income foregone' by the students while they study equals to the amount of money they would have earned had they not attended the school. The cost thus involved is not only a private cost to the students or their parents but it is also a social cost because the potential addition to GNP remains unrealized. *But in the context of the national economy this component of cost has to be adjusted on account of age-specific unemployment and mortality among the educated population.*

Further, length of school year and content of schooling are not uniform in the country. Therefore, it is very essential to take into account such variations while calculating unit cost of education. In order to make the point more explicit, we may, describe the national school system in the following manner: if higher secondary schools are ignored as well as pre-primary classes attached to general school education, we find two main systems, namely, one of ten years' duration and other of eleven years' duration. At present, there is no objective criteria by which either planned level of attainment or the average level of attainment of pupils completing the general school final examination can be compared and equated. But at the same time for purposes of admissions and recruitment, the systems are not considered different. Further, general school system is divided into three stages of unequal lengths and many times higher secondary schools have middle and primary sections attached and similarly middle schools have primary sections. Even the length of school years and the number of working hours vary from State to State. These are some of the important points which are to be taken into account while comparing unit cost of education for different levels of efficiency.

MEASUREMENT OF PRODUCTIVITY OF EDUCATION

It may be recalled that we have defined earlier the output of educational institutions as an amount of knowledge absorbed and capacities developed by the pupils during their stay till they leave the portals of educational institutions. *But it is certainly difficult to measure the output and its quality.* The usual method for judging the quality of output of educational institutions is to conduct large scale 'educational tests'. But present examination results are not at all a guide for measuring the quality of output of educational institutions because the achievements in examinations depend on personal characteristics like, motivation, personal ambitions, health, past records, etc., at least, as much as on the characteristics of the educational system under study. It has been suggested that educational tests should be given to the selected pupils who differ only in one parameter and the variations in output should be studied in relation to the inputs. It can be done only by organizing large scale sample surveys of the pupils in the country. But such large scale sample surveys involve use of critical resources and trained manpower. Therefore, this method of judging the quality of output is not relevant for underdeveloped economies like India. Hence, we have to develop techniques to study the quality of output by studying the internal and external efficiency of the school system in the country. These aspects are further elaborated below.

Internal efficiency. Internal efficiency of the school system covers the study of the problems relating to wastage and stagnation; drop-outs, utilization of school buildings and equipment; conservation, development, distribution and utilization of teaching and non-teaching manpower in school system; pupil-teacher ratio; teacher salaries; management; nature of schools; utilization of library facilities; length of schooling; time utilizations by the pupils; location of schools; and re-enrolment trends.

External efficiency. As the study of internal efficiency deals with qualitative aspects of the internal working of the school system, the external efficiency of the system indicates coordination between the school stage educational sector and economic and higher educational sectors. It has got both quantitative and qualitative aspects. In terms of quantity, it attempts to measure how far the system produces the required numbers of pupils needed for the remaining sectors. The qualitative aspect of the system tries to show whether the educational sector is producing the type of output needed according to the present and future needs of the economy. It may even involve the study of utilization aspects of the output of the educational institutions when the products of educational institutions get settled in employments. A study of 'after-education wastage' in the form of increasing average waiting period for employment seekers, under-utilization of those employed, etc., will be of immense use in the study of unit cost of education.

ORGANIZATION OF THE STUDY

As the title of the study indicates, the project has to cover all the States in the country and provide information about the inter-regional and inter-institutional variations in unit costs of education for different levels of efficiency. In this connection, the size of a country like India suggests that we should resort to selection of some districts within each State for intensive studies. Therefore, we have planned the study to be completed in three phases. The first phase will be in the form of pilot studies in each State. Methodological issues involved in measuring costs and productivity of education, the sampling scheme, schedules and other details about the second phase of the study will be finalized during this period. The second phase will be devoted to the main study and intensive field investigation in selected areas in different parts of the country. The third phase will be devoted to writing of reports of the study.

Ranking of Indian States

For organizing pilot and intensive investigations we have arranged different States according to a *joint index*. This index has been compiled by considering 25 crucial variables for the year 1961. Groupings of variables included in the index are given below:

Social-demographic Characteristics. Density of population; percentage of villages with population less than 500 persons to total number of villages; percentage of backward population to total population; percentage of school going children in the age group 6-13 to total labour force 15-59.

Ability and Efforts to Support Education. Income per capita; output per worker, income per child in age-group 6-13; agricultural income to total income; industrial income to total income; percentage of total revenue to state income; amount of state revenue per head; amount of central taxes per head; educational expenditure as percentage of State income; and educational expenditure as percentage of total State budget.

Educational Achievements—Stock. Percentage of population by sex who have passed (*a*) primary education, and (*b*) matriculation; and *Flow*: Enrolment in classes I-V as a percentage of population in age-group 6-10; enrolment in classes VI-VIII as a percentage of population in the age group 11-14; and enrolment in classes IX-XI as a percentage of population in age group 15-17. Teacher/pupil ratios in primary schools, middle schools and high and higher secondary schools.

For example, the classification of Indian States according to the *joint index* in the five zones is as*: *Eastern Zone*—West Bengal (5), Assam (9), Bihar (11), Orissa (15); *Southern Zone*—Madras (1), Kerala (2), Mysore (7), Andhra Pradesh (12); *Western Zone*—Maharashtra (3), Gujarat (4); *Central Zone*—Rajasthan (13); Madhya Pradesh (14); *Northern Zone*—Punjab (6), Jammu and Kashmir (10), Uttar Pradesh (8). Similar ranking of districts in each state will be undertaken during the period of pilot survey.

Collaboration with States. In each State collaboration of State Institutes of Education and the Directorates of Public Instruction in conducting studies on unit cost of education will be sought. Research studies will be jointly completed by the Economics of Education Unit and the State Institutes of Education of the respective States. In fact, preliminary work in this regard has been started for the States of Rajasthan, Mysore and Madhya Pradesh. Steps are now being taken up for building organizational arrangements in other States.

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*Number in bracket represents the ranking order of States.

Referees. 20 to 25 reputed experts in the field of Economics, Econometrics, Educational Planning, Educational Administration, Educational Finance, Economics of Education and Education will be sent papers, questionnaires, tools and techniques, research studies, methods of investigation, plan of tabulation and analysis of the data, etc., prepared by the Joint Research Team for their comments and suggestions. In the light of their comments and suggestions various stages of the project will be finalized and progressed further. Some of the experts in these fields have already been approached in connection with plan of studies of the Unit of Economics of Education and they have agreed to take interest in the work of the Unit.

Agencies like UNESCO, OECD, IIEP and other organizations which have done some work in this field or similar fileds will be requested to supply research material and experiences will be shared in the field.

Seminars and Panel Discussions. There will be one Advisory Committee of Experts to advise on the various stages of development of the project in each State. Experts in the field will be invited to contribute papers on various aspects of the project and those will be discussed in the seminars.

Research Team. The study will be conducted by the research team headed by the Project Leader, Reader incharge, Economics of Education Unit. In each State, there will be one cooperating research team to complete the studies for the respective States.

State Reports and General Report. After the completion of State studies, a series of State reports including main findings of the investigation will be submitted to appropriate authorities. In the end a general report will be drafted by the Project Leader and it will be submitted to the NCERT for onward transmission to appropriate authorities. The State Reports and General Report will also give projections of financial requirements for the next fifteen years for each State. These requirements will be worked out in relation to growth in State income, enrolment growth, teaching manpower requirements and structural changes in financing of education.

Chapter Two

On Costing of Education

B. DEY

Educational activity had been, for a long time, held as an unproductive sector in an economy and the concept of gain or loss was hardly ever associated with it. Until recently study on efficiency and productivity of educational expenditure had not drawn much attention of the economists. Money spent on both capital and revenue accounts constituted total expenditure on education and per capita estimates were based on this.

Gradually more and more studies on this branch of economics are being undertaken. The concept of no-gain no-loss is changing and as in any other branch of economics, *e.g.*, economics of manufacturing industries, agriculture, construction, etc., efforts are being increasingly made to compare cost of education with efficiency and productivity. The practice of measuring the product of this branch of activity together with consumption of input and employment of capital and labour is gradually developing. Even the introduction of input-output analysis in the field of education is not far off.

This ' manufacturing ' industry can be found to have distinct factors of production like any other industry. School buildings, play grounds, furniture and equipments, libraries are its capital which help repeatedly in the manufacture of educated young persons. Out of its inputs, books and stationery, meals to students, medical care, etc., may be treated as auxiliary materials consumed and human beings to be transformed into educated finished products are comparable with raw materials in other manufacturing industries.

Primary schools may be compared with primary industries like agriculture, mining, animal husbandry, etc., producing primary products for use as inputs in secondary industries like food processing, iron and steel industries, dairies, etc. Secondary schools admit students who have passed the primary stage of education as its raw materials, and with the help of other auxiliary materials such as books, etc., together with labour and fixed assets, they manufacture higher educated persons who are either directly consumed by the public sector or private sector (by employing them) or are transferred as semi-finished products to the manufacturing sheds of higher standard of education.

The teachers may be compared with the labourers in the manufacturing industries. They add more value to the native talents and gifts of little boys and girls in the primary schools and again in the institutes of higher education. As, from the same kind of raw material, say coal, some are converted into hard coke and some into soft coke according to the quality of coal, so also in this field some students are converted into doctors, some into engineers and others into clerks, agriculturists, etc., according to their natural quality, *i.e.*, merit.

Though there are similarities in many respects between education and other branches of economics, but some difficulties are unavoidable in evaluating input and output of the former. Output of this industry is mainly education imparted to the students. It is easy to measure the product of this industry in terms of number of students educated. But the main difficulty is with the assessment of the product in terms of money. Valuation of students at cost price is of course not so difficult. But without knowing the market value of the product, we cannot compare cost with efficiency or productivity of the industry.

All students are not equal in terms of value. In different schools and in different branches of education, qualities and value of students vary widely. Even in the same branch and in the same school they are different. Market value of education may be assessed either in terms of one's rate of earning after completion of education in terms of how much one earns during one's working life minus what one would have earned as an unskilled worker. If we are satisfied with comparing cost with efficiency of education, the former is more or less a satisfactory indicator. But we encounter difficulties if we go further, *i.e.*, to estimate the total earnings of an educated person, and the productivity of the industry. In that case, we have to wait for the whole working life of a person to assess his total earning, *i.e.*, market value of a student-product after measuring his cost of education with the assumption that his income during his working life is the outcome of his education and training. It is then logically reduced to the fact that total income of all skilled persons minus their total income as unskilled workers in a country is the output of the education and training industry.

How to cost

This paper is mainly concerned with the costing of education and we shall discuss how to arrive at a correct cost of education. In this connection, we may refer to the book, *Cost of Education* by J. Vaizey, from which a list of items of expenditure on education can be prepared, duly grouped as under:

A. *Direct Expenditure*

Teachers' salaries and allowances;

STATE INSTITUTE OF EDUCATION Govt. of West Bengal

Salaries and allowances of non-teaching staff in schools;
Books and stationery;
Equipment and furniture;
Light, fuel and water;
Maintenance of assets and cleaning;
Rent, rates, taxes and insurance ; and
Others.

B. *Meals and Tiffin*
Schools' contribution;
Equipments for preparing meals;
Salaries of kitchen staff; and
Parental contribution to meals.

C. *Students' Health Services*
Salaries of medical officers and nurses;
Travelling expenses;
Medical materials, etc.; and
Administrative overheads.

D. *Training of Teachers*
Teachers and staff salaries;
Books and stationery;
Furniture and apparatus and equipment;
Rent, rates and taxes;
Repair and maintenance of assets;
Fuel, light and water;
Boarding expenses.

E. *Administration and Inspection*
Salaries of Inspectorate staff;
Printing and Stationery;
Travelling expenses; and
Share of expenses of others administrative departments.

F. *Transport Services*
Salaries of drivers and attendants;
Cost of oil; and
Repair and maintenance of transport equipments.

But the above items are for the U.K. where educational expenditure is mainly borne by the State. In our country, a lion's share of this expenditure is still shared by guardians of students. Some adjustments may be made to suit the conditions prevalent in our country.

This is also important in respect of the collection of information on such items.

Salaries of Teachers and non-Teaching Staff. These items are not solely borne by the State. It is partly met by tuition fees paid by the students and partly by the Government and other public bodies. Fees paid to the private tutors (it may be taken as an item of cost) is completely borne by guardians. Information on this item can only be had from household enquiries. But the information about the other portion is available from government publications and school records.

Books, Stationery, Equipment and Furniture. Expenditure on books and stationery may be divided into two parts—one part is incurred by schools for administration and other is borne by the guardians for use of students. Of these, books are a major item which is wholly borne by the guardians. Household enquiry is therefore necessary to have information on this item and for the rest, school account books can supply the data.

As regards equipment and furniture, this is an item of capital expenditure and has been treated in subsequent paragraphs.

School Meals Including Parental Contribution. Unlike foreign countries most of the students carry to school their meals and tiffin from their respective homes. Some students reside in school boardings/hostels but the expenditure is fully met by their parents. Except in few cases, schools' contribution towards meals and tiffin of students is negligible. Parental contribution towards school meals and tiffin together with boarding/hostel charges should be included in cost of education. The data on this item may be collected by household enquiry and for the schools' share of contribution, if any, are available from school account books.

School Health Services. In our country expenditure on this head is very limited so far as secondary stage of education is concerned. Information on this item of expenditure, if any, would be available from the respective schools.

Logically, it may be said that expenditure made by parents on daily food, clothing and medicines of a school going boy/girl should be taken as cost of education. Of course, one may argue that even if the boy were not a student, he would be taking food, etc., from home. This is a very disputed item and we have dropped it from our cost sheet.

Training of Teachers. This is an item of expenditure which is insured for the training of teachers every year. The teachers when trained, teach many students in their service life. So, theoretically, this item could be capitalized and distributed over all the students taught by the teachers in their life time; but in practical terms it is not possible. A certain amount of expenditure is incurred every year on this account which is of a recurring nature and more or less in proportion to the increasing number of students. Again, per student expenditure on this account is very negligible. There will, therefore, be not much harm if this item is taken as revenue expenditure.

Information on this item is available in the publication of the Ministry of Education, Government of India. But the difficulty is with the time lag in publishing the materials. Data for 1960–61 were made available only during the beginning of 1966.

Administrative and Inspection Overheads. This item may be estimated from government budgets on education. But the difficulty is how to allocate the total expenditure incurred at the ministerial levels of Central and State Governments down to the inspectorates over primary and secondary schools, colleges, universities and other institutions. Expenditure on the inspectorate of different branches are different and data on their expenditure may be available from the respective inspectorate directly. The expenditure on rest of the supervision may be equally distributed over all the students.

Capital Expenditure. A huge amount of money is spent every year on acquiring land and constructing school buildings or on purchase of furniture, equipments and library books. The prevalent system is not to maintain a separate account for expenditure on the above items and to include it in the total amount spent on education. The Ministry of Education also has not excluded this amount from estimating direct expenditure (not cost) for educating a student. But these assets are not exhausted within one year in the education of a single group of students. With the introduction of the new idea of estimating cost (instead of expenditure) for comparison with productivity and efficiency of education, these items of expenditure should be capitalized as is done in any other industry. As usual, expenditure on repair and maintenance and an amount of depreciation at certain percentages according to the life expentancy of each asset, should be included in the revenue account.

In a newly started school, heavy expenditure is incurred on construction of school buildings, purchase of equipments, furniture and library books in the first few years. Cost of education will be unduly inflated if the huge amount spent on assets during the initial period is distributed over the students in the same period. Again, in old schools where expenditure on capital account is minimum, cost of education will be too cheap in comparison with the former.

A STUDY BY THE INDIAN STATISTICAL INSTITUTE

The Planning Division of the Indian Statistical Institute, while conducting a pilot enquiry on the distribution of public health and education services, collected some data on the cost of education for the period 1963 in Madhyamgram, an urbanized village in the district of 24 Parganas, West Bengal, 10 kilometres away from Calcutta. The main objective of the survey was to collect information on how people of different income groups share public expenditure on health and education.

With a view to measuring these benefits in terms of money, we approached the schools and colleges in and around the village where most of the boys and girls of the village are taught, to collect information on cost of education from these sources.

Finally, we gave up the above idea and used the indicators of number of students and number of free and half-free students for distribution of education services and number of visits to outdoor departments and number of days-stayed in in-door beds of hospitals for distribution of health services. The details of the study are given in the paper *Distribution of Public Health and Education Services.**

In this paper we have presented the data on cost of secondary education. The data were collected from all the five schools in the area which imparted training to 2,227 students during 1963. We analysed their Receipts and Payments and Income and Expenditure Accounts and prepared a consolidated list of assets for estimating depreciation.

The purpose of presenting the data is not so much for exhibiting the results of the survey but to show how we have arrived at the estimate of cost of educating each unit of product, i.e., student.

Receipts and Payments Accounts. The consolidated Receipts and Payments Account for all the five schools has been presented in Table 1 at the end showing money received and paid for various items during the year 1963. The amounts thus not only include transactions made for the year under reference but also against arrears of last year. Transactions both in respect of capital and revenue accounts are also incorporated in this account.

Income and Expenditure Account. A consolidated Income and Expenditure account is given in Table 2. This may be compared with Manufacturing and Trading Account of a manufacturing company or a business house. This includes only the amounts relevant for the year under reference adjusted for arrears and advances. Transactions on capital account are completely excluded from this account.

As this account is prepared from transactions through schools only, the expenditure incurred by the parents are not incorporated here. To have a complete direct cost of educating a student, we should add parents' expenditure on books, meals, stationery and uniforms, etc.

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*N. Bhattacharya and B. Dey, 'Distribution of Public Health and Education Services', *Economic Weekly*, Vol. XVII, No. 23, June 5, 1965.

List of Assets. The consolidated list of assets of the five schools including additions and improvements as on 31.12.1963 is given in Table 3. The two extreme right hand columns of the Table give rate and amount of depreciation. The Table shows that during the year Rs. 4,42,301·00 worth of assets were in employment in the schools whereas during the year the following amounts have been spent on different assets.

Item	*Amount in Rs.*
Library	1,613·64
Development	12,468·90
Furniture and Equipment	10,270·00
Building construction	33,095·00
TOTAL	Rs. 57,447·54

If we add to the cost the whole amount spent on capital account instead of depreciation, the capital cost will be nearly double. Again, the cost on capital account will be different between new and old schools. New schools have to spend a considerable amount on building construction and acquiring other assets whereas old schools can manage with spending a negligible amount on maintenance and improvement.

Rate of depreciation is a very disputed item even in long established company accounts. In the absence of any definite data on the life expectancy of different assets, we have depreciated land and building at 5 per cent and other assets at 10 per cent of the value of the respective asset as at the end of the year.

Number of Students. Table 4 gives the number of students in the five schools in each of the classes from V to XI. During 1963, 2,227 students had their education in the above schools. The total amount of expenditure has been distributed over these students to work out the average per student estimate. In West Bengal, classes V to XI are taken as secondary stage. Per student estimate of cost increases in the higher classes but as separate data are not available in hand we could not make a distinction.

Teachers' Training. Expenditure on this item is available from education in India in consolidated amounts by sources of funds for different standards which have been used here. Teachers in high and higher secondary schools generally have their training in post-graduate and under-graduate colleges in West Bengal. We have, therefore, taken expenditure for these two standards of teachers' training for estimating per capita cost for secondary students. Total direct expenditure on teachers' training in West Bengal and number of pupils in secondary stage during 1959–60 and 1960–61 are as under:

S. No.	*Level*	1959-60 *(Amount in Rs.)*	1960-61
0	1	2	3
1.	Post-graduate teachers' training colleges	9,43,731	11,32,370
2.	Under-graduate teachers' training colleges	2,00,094	2,01,582
3.	TOTAL	11,43,825	13,33,952
4.	No. of pupils in middle stage	665,038	767,529
5.	No. of pupils in secondary stage	181,346	218,204
6.	TOTAL	846,384	985,733
7.	Average cost per pupil of secondary stage on teachers' training	Rs. 1·35	Rs. 1·35

Total amount of expenditure has been distributed over total number of students in secondary stage to arrive at the average cost on teachers' training. It may be noticed that during both years the averages have not changed. In the absence of data for 1963, we have used these averages assuming that these have not changed considerably.

As already stated, although this item of expenditure should have been capitalized, we have directly charged to revenue account.

The Cost. Table 5 gives a consolidated cost sheet together with estimated amount of cost by items for the five secondary schools for 1963. Schools' share towards direct expenditure on education of Rs. 92·98 has been estimated from Income and Expenditure Accounts of the schools. But the guardians' expenditure could not be collected.

None of the schools spent anything towards meals and tiffin, health services and transport services for the students during the year. Administrative and inspection items have been shown blank as the data on them are not available.

Total cost of education per student in the year is estimated at Rs. 106·86. This amount excludes expenditure on guardians' share towards books and stationery and school meals. It also excludes government expenditure on supervision and inspection.

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TABLE 1

Receipts (Rs.)			Payments (Rs.)	
1			2	
To Students' fee			By Teachers salary and D.A.	1,40,222·14
—tuition fee	41,326·00		,, Non-teaching staff salary and D.A.	10,504·53
—Fine	235·29		,, School's contribution to P.F.	3,608·49
-admission and transfer fee	1,533·05		,, Teachers' share to P.F.	3,502·37
—game fee	1,292·50		,, Contingency	7,989·05
—magazine fees	1,248·00		,, Rent and taxes	4·47
—examination fee	6,197·75		,, Games account	1,371·79
—library fee	1,287·96		,, Examination account	4,609·64
—development fee	9,762·75		,, Magazine account	1,263·76
—building fee	703·00	63,586·30	,, Tiffin of staff account	303·74
			,, Repair and maintenance	17,812·26
,, Teachers contribution to P.F.		1,605·11	,, Miscellaneous account	1,887·21
,, Refund to School D.A.		35·00	,, Library account	1,613·64
,, Donations		6,006·12	,, Development account	12,468·90
,, Miscellaneous account		584·00	,, Audit fee	500·00
,, Government stipend received		15,731·10	,, Government stipend disbursed	2,776·65
,, Government D.A. received		6,583·76	,, Appliances and furniture	10,270·00
,, Government grant-in-aid		92,000·81	,, Building construction	33,095·00
,, Government grant for library		2,232·50	,, Excess of receipts over payments	1,10,298·07
,, Government grant for equipment		92,125·00		
,, Government grant for building		84,062·00		
TOTAL		3,64,551·71		3,64,551·71

TABLE 2

Expenditure (*Rs.*)			*Income* (*Rs.*)		
1			2		
To Teachers' salary and allowances		1,40,222·14	By Tuition fees		
,, Non-teaching staff and allowances		10,954·33	—realized	41,326·00	
,, Schools' share of P.F. contribution		3,608·49	—unrealized	12,638·50	
,, Contingency accounts		7,989·05			53,954·50
,, Rent and taxes		4·47	,, Other fees from students—		
,, Magazine account		2,069·40			
,, Games account		1,371·79	—fine	235·30	
,, Examinations account		4,609·64	—Admission and transfer	1,533·05	
,, Repair and Maintenance		17,812·26	—game fee	1,292·50	
,, Tiffin to teachers		303·74	—magazine	1,248·00	
,, Miscellaneous account		1,887·21	—examination	6,197·75	
,, Audit fee		500·00			10,506·00
,, Government stipend			,, Private donations		6,006·12
—disbursed	2,776·65		,, Private Miscellaneous		584·00
—undisbursed	12,954·45		,, Government and Public Bodies		
		15,731·10	—grant of stipends, etc.	15,731·10	
			—teachers' D.A.	6,583·76	
			—grant-in-aid	92,000·81	
			—grant-in-aid receivable	21,696·93	
					1,36,012·60
TOTAL		2,07,063·82			2,07,063·82

TABLE 3

S. No.	*Item of asset*	*Total amount (Rs.)*	*Proposed rate of depreciation*	*Amount of depreciation (Rs.)*
0	1	2	3	4
1.	Land and Buildings	3,26,157·00	5%	16,307·85
2.	Furniture	52,866·00	10%	5,286·60
3.	Science equipments, etc.	49,305·00	10%	4.930·50
4.	Library Books	13,973·00	10%	1,397·30
	TOTAL	4,42,301·00		27,922·25

TABLE 4

NUMBER OF STUDENTS BY CLASSES AND NUMBER OF TEACHERS AND STAFF, 1963

S. No.	*Class*	*No. of students*	*No. of teachers and staff*
0	1	2	3
1.	V	538	
2.	VI	510	
3.	VII	405	
4.	VIII	305	
5.	IX	195	
6.	X	160	
7.	XI	114	
	TOTAL	2,227	104

TABLE 5

CONSOLIDATED STATEMENT OF ANNUAL COST PER STUDENT, 1963

Item	*Total* (*Rs.*)	*Per student* (*Rs.*)
1	2	3
A. Direct Expenditure		
School Share—		
Salaries and allowances of teachers	1,40,222·14	62·96
Salaries and allowances of non-teaching staff	10,954·53	4·92
Contribution to P.F. and retirement pensions, etc., of teachers and staff	3,608·49	1·62
Printing and stationery (magazine, game, examination, etc.)	8,050·83	3·62
Contingency (including teachers' tiffin, miscellaneous, etc.)	10,180·00	4·57
Fuel, light and water	*Nil*	*Nil*
Rent, rates and taxes	4·47	0·01
Repair and maintenance	17,812·26	8·00
Audit Fee	500·00	0·22
Stipends and scholarships	15,731·10	7·06
Contribution towards student meals/tiffin	*Nil*	*Nil*
	2,07,063·82	92·98
Guardian's share—		
Books	*	*
Stationery for students	*	*
	*	*
B. Meals and Tiffin		
Schools' share—		
Food stuff	*Nil*	*Nil*
Equipments for preparing food	*Nil*	*Nil*
Salaries of kitchen staff	*Nil*	*Nil*
Parental contribution	*	*
	Nil	*Nil*
C. Students' Health Services		
Salaries of doctors and nurses	*Nil*	*Nil*
Travelling expenses	*Nil*	*Nil*
Medical materials, etc.	*Nil*	*Nil*
	Nil	*Nil*

TABLE 5—(*Contd.*)

Item	*Total* (*Rs.*)	*Per student* (*Rs.*)
1	2	3
D. Training of Teachers		
Teacher and staff salary and allowances	*N.A.*	*N.A.*
Books and stationery	*N.A.*	*N.A.*
Furniture and equipment	*N.A.*	*N.A.*
Rent, rates and taxes	*N.A.*	*N.A.*
Repair and maintenance of assets	*N.A.*	*N.A.*
Fuel, light and water	*N.A.*	*N.A.*
Other	*N.A.*	*N.A.*
Boarding expenses	*N.A.*	*N.A.*
	..	1·35
E. Administration and Inspection		
Salaries of Inspectorate staff	*	*
Stationery of Inspectorate staff	*	*
Travelling expenses of Inspectorate staff	*	*
Share of expenses in other administrative departments	*	*
	*	*
F. Transport Services		
Salaries of drivers and attendants	*Nil*	*Nil*
Cost of oil	*Nil*	*Nil*
Repair and maintenance of transport equipments	*Nil*	*Nil*
	Nil	*Nil*
G. Depreciation on Assets		
School buildings	16,307·85	7·32
Furniture	5,286·60	2·37
Equipments and apparatus	4,930·50	2·21
Library books	1,397·30	0·63
Transport equipments	*Nil*	*Nil*
	27,922·25	12·53
Total annual cost per secondary students (excluding guardians' share of books, stationery, meals and cost of administration and inspection)		206·86

N.B. * indicates data not in hand.

N.A. detailed breakdowns are not available.

Chapter Three

Unit Costs of Educations, our Knowledge, Gaps and our Need

D. L. SHARMA*

The object of this paper is to highlight the significance of unit costs in the planning process, to comment on the nature of available statistics, to develop a methodology to use the existing educational statistics and to suggest areas for future work. The paper has been divided into four sections.

The first section deals with the importance and nature of Unit Costs required at different levels of education with special reference to Indian conditions as at present and their role in measuring various inputs and outputs.

The second section deals with the nature of available statistics, their coverage, gaps and their limitations.

In the third section a method has been developed to utilize the existing statistics in measuring the cost per student at different levels of school education and to find the extent of wastage of resources on account of drop-outs and stagnation.

The fourth section lists the various points for discussion, various suggestions for improvements, need and direction for future work.

SECTION I

Need of Unit Costs

The need of complete knowledge about various types of unit costs for different disciplines and different levels of education in the planning process cannot be over-emphasized. The unit costs are needed:

i. for working out financial allocations and costing of educational programmes;

ii. for studying the level of efficiency at which the educational plant is run;

iii. to ensure optimum utilization and to improve the efficiency of resources invested in education through their analysis and consideration of various alternative combinations of their components; and

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iv. to measure the costs of inputs in the education industry in determining the returns to education and productivity of the process.

Nature of Unit Costs Required

With the increasing demand for education, there is always need for further expansion both in the horizontal and vertical directions. It is, therefore, very necessary to know:

i. how much will it cost to educate one extra student;
ii. how much will it cost in making provision for an extra class or introduction of a new subject in an existing institution; and
iii. how much will it cost in opening a new institution for given courses and given number of students.

It is also very essential to know the detailed break up of all the above unit costs into various components of expenditure such as the cost of land, farm, construction of building, salaries to teaching staff, salaries to non-teaching staff, rent, rates and interest, contingencies, library and laboratory equipment, scholarship, stipends and other financial concessions, administration, direction and inspection and on all other items, details of which are given in Appendix I at the end.

Their Use in Cost Analysis and Cost Control

Unit costs are also essential in cost control and cost analysis which are very important in the present Indian conditions. Cost analysis aims at breaking down the total cost into various components. It enables to compare the cost of the same element in different types of institutions in different States. It will indicate, how and where to economize.

Although there has been a considerable growth* in the educational expenditure since independence, yet, the gap between the achievements as at present and the desired achievable goals is very wide. In order to narrow this gap we require huge† resources, which under the present Indian conditions are difficult to come forth. Therefore, there is great need for economy and trying out new methods of achieving the same aims with different combinations of factors. The scope of such judicious manoeuvring can be very easily seen from the conditions prevailing in different States. It will be seen from Table 2, that there are huge differences in the average annual cost per student in different types of schools in various States. The States which are spending more, are not necessarily providing better facilities or better quality of students. In primary schools, Madhya Pradesh spends Rs. 40·1 on each student while, Madras by spending only Rs. 30·4 per student provides better facilities. Similarly in high and higher secondary schools, Orissa spends Rs. 93·4 per student, while Punjab and Kerala spend only Rs. 59·1 and Rs. 63·5. It is therefore, very likely that by a careful analysis of unit of costs on various items of expenditure on education in these States, we may arrive at certain combinations of various factors which may be economic and efficient.

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*During the period 1950-51 to 1965-66, the total educational expenditure increased from Rs. 114 crores to Rs. 600 crores. The rate of increase being 11·7 per cent as against 5·2 per cent in National Income. The proportion of National Income spent on education increased from 1·2 per cent to 3·0 per cent. For further details please see Table 1 at the end. (All the figures are at current prices.)

†Our requirements are about 7 to 8 per cent of the National Income.

SECTION II

Nature of Available Statistics

As it is well known, the cost per student has three‡ major components namely, the institutional costs, the students' costs, and the opportunity costs. By institutional costs we mean the expenditure which is incurred directly or indirectly in the actual process of imparting instructions in the institution such as the total budgeted expenditure of the institution; expenditure on direction and inspection; expenditure on pensions paid to teaching and non-teaching staff and expenditure on the managing agencies of the institutions. By students' cost we mean, the cost on account of tuition fees and other fees, purchase of books and stationery, school uniform, transport, boarding and lodging and any other additional cost which the student might not have incurred, had he not been studying. The opportunity cost is the amount foregone by the student which he would have earned but for his continuing the education.

As said earlier, complete knowledge about all these costs is very essential for the planning process and assessment. We shall now see how far these are available from the existing statistics. The only reliable educational statistics are the statistics collected annually by the Ministry of Education from the various States and Universities in Forms 'A' and 'B'. The statistics collected in Form 'A' pertain to all the educational institutions located in the State, while the Statistics collected in Form 'B' pertain only to colleges and courses affiliated to the university. The statistics collected are about number and management of institutions, enrolment by type and by levels of education;

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‡Please see Appendix I at the end.

expenditure and teachers by type of institutions, examination results and on many other items of educational importance.

These statistics though very useful for administrative purposes have a limited use for planning and for calculation of unit costs on account of the following reasons.

a. *Time Lag.* The collection and publication of statistics takes a very long time and generally the gap between the date of reference and date of publication is more than three years. As such the statistics when published become out of date.

b. *Coverage.* i. The statistics do not include the expenditure incurred on account of pensions paid to teachers and other staff in the Directorate and Inspectorate, the expenditure incurred on the central Ministry of Education, University Grants Commission, National Council of Educational Research and Training, various education departments in the State Secretariats and the expenditure incurred on many other organizations which directly or indirectly contribute to education.

ii. The items of expenditure which are not covered under grant-in-aid rules are also under reported.

iii. The extent of under reporting in the Government expenditure can be seen from the figures given in Table 3 which compares the expenditure from Revenue accounts of the Centre and States as obtained from Indian Economic Statistics Part II, Ministry of Finance and the non-capital expenditure on Education from Government funds as reported in *Education in India* Volume II. It will be observed that the expenditure as reported in *Education in India* is always less than the actual expenditure incurred by the Government. In fact the expenditure indicated in *Education in India* should be more than the expenditure from revenue accounts because it includes also the expenditure incurred by other Ministries on Education such as Ministries of Health, Agriculture and various other Departments.

iv. The coverage is only of recognized educational institutions and their expenditure. There are many unrecognized agencies who spend substantial amounts on education, but it is not included in the reported statistics. Besides, generally the institutions get recognition after a few years of their foundation and most of the expenditure which is spent on site, building and other capital equipment before their recognition does not get reported in official statistics at any stage.

v. Of the 3 components of costs as mentioned earlier, these statistics relate to only first type of costs. No information is available about students' cost or opportunity cost.

c. Classification of the Data. i. The statistics are available only by type of institutions and not by levels or courses of education. As for example, in a high school having middle and primary departments attached to it, the expenditure on the complete school is lumped together. The same is true about middle schools where primary classes are attached. It is, therefore, difficult to find the expenditure per student at secondary stage or at middle stage from the existing statistics.

ii. There is a big difference in cost per student at undergraduate and post-graduate level in pure sciences, natural sciences, humanities and in social sciences, but from the existing statistics we cannot find these costs separately for each course or for each level of education.

iii. The total direct expenditure is broken up into only two parts, the teachers' costs and the non-teachers' costs. Separate data for salaries of non-teaching staff, expenditure on maintenance and repairs to the buildings, maintenance of library and laboratory, contingencies, health services, conducting examinations and on many other major activities of the institutions are not available.

iv. The break-up of indirect expenditure which forms about 25 per cent of the total expenditure and includes expenditure on direction and inspection, buildings and other major equipments, scholarships, stipends and hostel charges, etc., is not available according to different levels of education.

d. The expenditure is available only at current prices. It is, therefore, very difficult to ascertain whether the increase is on account of qualitative improvements or on account of rise in prices. In the absence of detailed expenditure on different items, and the corresponding index numbers, it is not possible to convert it at constant prices.

e. Against each type of institution, the aggregate statistics of all the institutions located in the State are given. As such from these statistics the expenditure incurred in the opening of new institutions cannot be found out.

On account of above limitations, the existing educational statistics cannot be gainfully utilized in measuring unit costs for various purposes of planning and assessment. Their modification and reclassification keeping in view their utility for various purposes is very essential.

SECTION III

At present the cost per student which is generally used in Government documents is obtained by dividing the total direct expenditure on a particular institution by the total enrolment without taking into consideration various levels of education in the institutions. As such the average cost per student in a high school goes down on account of presence of students of middle and primary levels of education. The same happens in middle schools as well. But as said earlier, for planning purposes we need the costs at different levels of education more often than the cost by type of institutions. It, therefore, becomes very necessary to find the costs at various levels of education.

In this section, an attempt has been made to develop a methodology to calculate the expenditure at different levels of school education from the existing statistics and to find the extent of resources which are being wasted in the present set up.

So far as primary education is concerned, there is no difficulty in finding the expenditure per student because the influence of pre-primary classes attached to primary schools is insignificant. The main difficulty arises in the middle and secondary schools, where separate enrolment and expenditure figures for middle and secondary stage are not available. The central idea of the method adopted is to eliminate from middle schools, the enrolment in primary departments and their share of expenditure and to find the cost per student from the residual expenditure and enrolment which obviously relate to middle stage. Similarly to find the expenditure per student at high/higher secondary stage, the process involves the elimination of the effect of middle and primary stage enrolment and expenditure from the high/higher secondary schools.

From *Education in India* Vols. I and II, we can find the enrolments and expenditure on different types of institutions and enrolment at different stages of education. The enrolment given for primary stage is composed of, primary stage enrolment in primary schools and primary stage enrolment in attached classes to middle and high/higher secondary schools. Similarly the enrolment at middle stage is composed of enrolment in middle departments in middle and high/higher secondary schools. The main problem is to distribute the enrolment in high/higher secondary schools into primary, middle and high/higher secondary departments and the enrolment in middle schools into middle and primary departments in such a way, that the aggregated figure thus obtained for different departments may be exactly equal to the given enrolment at different stages of education.

The enrolment as given in *Education in India*, Vols. I and II can be arranged in the following way.

ENROLMENT AT DIFFERENT STAGES AND IN DIFFERENT TYPES OF SCHOOLS—1960-61

(*in 000's*)

S. No.	*Type of School/ Stage of Education*	*Pre-Primary Schools*	*Primary Schools*	*Middle Schools*	*High/ Higher Secon-dary Schools*	*Total*
0	1	2	3	4	5	6
1.	Pre-Primary Stage	121	58	...	...	179
2.	Primary Stage	...	26,585	*a*	*b*	33,631
3.	Middle Stage	...	...	*c*	*d*	7,480
4.	High/Higher Secondary Stage	...	...	...	3,596*	3,596*
	TOTAL	121	26,643	10,610	7,512	44,886

SOURCE: *Education in India* Vols. I and II—1960-61.

*Includes the enrolment in classes XI and XII in Uttar Pradesh and also enrolment in other courses (except primary and middle departments) attached to high and higher secondary schools.

Apparently there seem to be four unknowns in the above Table but a little careful analysis reveals that in reality there is only one unknown and if we know the value of (*a*), we can find the values of (*b*), (*c*) and (*d*).

From the statistics received from about 12 States and Union Territories for the year 1964–65, it is found that about 64 per cent of the enrolment in middle schools belongs to primary stage. By applying this percentage to enrolment in middle schools in the above Table, we find the value of (*a*) which comes to 6,790 (thousands). Substituting this value of (*a*) we find the values of (*b*), (*c*) and (*d*) which come to 256, 3,820 and 3,660 (thousands).

The break up of enrolment in different types of schools into various departments as obtained above and the direct expenditure on these schools has been rearranged in the table below:

ENROLMENT AND EXPENDITURE BY TYPE OF INSTITUTIONS—1960-61

S. No.	*Type of School*	*Enrolment by levels of Education (000's)* Pre-Primary Stages	Primary Stages	Middle Stages	High/ Higher Secon-dary Stages	Total	*Total expen-diture (Rs. in 000's)*
0	1	2	3	4	5	6	7
1.	High/Higher Secondary Schools	...	256	3,660	3,596	7,512	689,117
2.	Middle Schools	...	6,790	3,820	...	10,610	429,220
3.	Primary Schools	58	26,585	...	...	26,643	734,461
4.	Pre-Primary Schools	121	...	...	...	121	5,873

This is the operative table and from this we can find the expenditure per student at different levels of education.

By deducting* from the expenditure of primary schools, the expenditure on educating 58 thousand students of pre-primary stage, we find the expenditure in primary schools on students studying at primary stage. Dividing this by 26,585, we find the cost per student at primary stage. It comes to Rs. $27{\cdot}5 = \dfrac{(734{,}461 - 48{\cdot}5 \times 58).}{26{,}585}$

Similarly by deducting from the expenditure on middle schools the expenditure incurred on students at primary stage in middle schools we find the cost per student at middle stage. It comes to Rs. 63·5 $= \dfrac{(429{,}220 - 27{\cdot}5 \times 6{,}790).}{3{,}820}$

Similarly the cost per student at high/higher secondary stage comes to Rs. $125{\cdot}00 = \dfrac{(689{\cdot}117 - 27{\cdot}5 \times 256 - 63{\cdot}5 \times 3{,}660).}{3{,}596}$

The improvement and the utility of figures thus obtained can be seen from the Table given below, by comparing the costs per student by type and by level of education.

Cost per Student

S. No.		*By type of Institution*	*By level of Education*
0	1	2	3
		Rs.	Rs.
1.	High/Higher Secondary	91·7	125·0
2.	Middle	40·5	63·5
3.	Primary	27·6	27·5
4.	Pre-Primary	48·5	48·5

As the number of students involved at each stage of education runs into millions, this difference in costs by levels and by type of institutions introduces a significant error in the final calculations of extra financial resources needed for education. The cost per student as obtained above can also be used in measuring productivity and returns to education by adding to it the computed cost per student on account of indirect expenditure and the opportunity costs, if any.

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*Here the author has assumed that the cost per student at primary stage is same, whether he studies in primary school or in middle school or in high school. Similarly the cost per student at middle stage in middle schools and in middle sections attached to high schools is assumed to be same. Further work to find the difference between these costs is necessary.

Now we shall examine the wastage in the system on account of drop outs and stagnation. At present about 60 per cent of the students who join class I do not reach class V at all. So the wastage is about 60 per cent in terms of enrolments at the primary level. But the picture is quite different in financial terms, because those who drop out from the system, leave after putting in one year, or two, three or four years or even more than four years of schooling in different classes from I to V and every year some amount of money was spent on them. This is not all. Some of the students who reach class V or those who drop out repeat many times in different classes. This also involves more expenditure than the absolute minimum which should be spent on the system under ideal conditions. So in order to measure the total effect we have to combine the effect of drop-out and stagnation. The figures given below indicate the extent of stagnation in the system.

INDEX OF STAGNATION

S. No.	*Class*	*Boys*	*Girls*	*All children*
0	1	2	3	4
1.	I	·40	·47	·42
2.	II	·28	·36	·31
3.	III	·23	·27	·24
4.	IV	·22	·26	·23
5.	V	·16	·20	·17
6.	VI	·14	·17	·15
7.	VII	·14	·18	·15
8.	VIII	·13	·16	·14

SOURCE: A paper 'Stagnation at Elementary Stage' prepared by the author.

By the index of stagnation we mean the excess of time over one year spent on an average by a student in a particular class. In financial terms this index shows the excess of amount spent per student per year in each class.

The effect of drop-outs and stagnation can be combined in the following way.

Let us start with, say, E_1 students in class I in a particular year, E_3 in class II next year, E_3 in class III a year after and so on, we end with E_5 students in class V after 5 years. In fact the real output is these E_5 students and the amount spent on them. Rest of it was wasted in the process. If there had been no drop-outs and stagnation we would have spent only Rs.* ($Y \times E_5 \times 5$)—(i) in bringing these students to class V. But in actual practice we spent as follows:

Rs. $E_1 \times Y \times S_1$† in the first year.
Rs. $E_2 \times Y \times S_2$ in the second year.
Rs. $E_3 \times Y \times S_3$ in the third year.
Rs. $E_4 \times Y \times S_4$ in the fourth year.
and Rs. $E_5 \times Y \times S_5$ in the fifth year, or in all we spent.

Rs. $Y(E_1S_1+E_2S_2+E_3S_3+E_4S_4+E_5S_5)$—(ii) The difference between this expenditure shown at (i) above indicates the extent of wastage of resources invested at primary stage of education. This excludes the indirect expenditure incurred on primary schools.

Applying this formula to actual statistics, it is found that in order to get an enrolment of 3,611 (thousands) in class V in the year 1960-61, we spent Rs. 1,052·8* millions. The same output would have been achieved with only Rs. 496·5 millions if there had been no drop-outs or stagnation. In other words, the output which we got at primary stage by spending Rs. 212 could have been obtained by spending only Rs. 100.

This shows the extent of wastage of resources on account of drop-outs and stagnation. As most of the drop-outs and even stagnation is on account of poor economic conditions of students, it is very likely that by spending a little more at primary and at middle stages (by giving some financial aid to the students in the form of books, stationery, school uniform, midday meals, etc.) we may get much more output for each Rupee spent on education at this level of education.

SECTION IV

Points for Discussion

a. Should the expenditure on Ministry of Education, University Grants Commission, National Council of Educational Research and Training, State Education Departments and various other organizations responsible directly or indirectly for education be included in the Annual Educational Expenditure? If yes, then where should it be shown and how should it be distributed between students at different levels of education?

b. How should the expenditure on account of pensions paid to teaching and other non-teaching staff who had worked in the educational industry be apportioned to different levels of education ?

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*Y is the average annual cost per student at primary stage.

†$S_1=(1+s_1)$; $S_2=(1+s_2)$ . . . . $S_5=(1+s_5)$, where s_1, s_2 . . . . s_5 are the stagnation indices.

*For details and for the extent of wastage of resources at middle stage, please see Table 5 at the end.

c. How should the expenditure on items which are common for the whole institution (core staff, library, etc.) be distributed among different levels of education ?

d. Inclusion of capital cost in the cost per student will raise the cost per student abnormally during the year of construction of the building. How to compute the rental value of old buildings say the Bombay University building ?

e. What type of data (in details) is available for measuring returns to education ? Possibilities of its collection, etc.

Suggestions for Further Work

a. A sizable amount invested in the educational system is being wasted. Special efforts may be made to reduce the wastage and stagnation in the educational system.

b. The existing forms may be revised keeping in view the comments given in Section II of the paper.

c. The extent of under reporting in educational statistics may be ascertained by conducting sample surveys and immediate efforts may be made to cover the gaps.

d. A methodology to convert the expenditure on education at current prices to expenditure at constant prices may be developed.

e. In order to measure the productivity of the educational process, the data on incomes of people with various levels of education and other relevant statistics may be collected through sample surveys.

f. In order to fix certain norms for the different items of expenditure needed for various units of education, and to explore, for efficient utilization of resources, and new combinations of various components of the educational costs, it is very essential to conduct a number of unit cost studies both at the school stage and at the university stage.

g. The composition of various items of expenditure (time series data) in some institutions which have established their reputation for excellence may be analysed to reveal the ideal norms for expenditure on different items (a sort of case study of a few institutions should be undertaken).

TABLE 1
GROWTH OF EDUCATION IN INDIA 1950–51 TO 1965–66

S. No.	*Item*	1950–51	1955–56	1960–61	1965–66 *(Estimated)*
0	1	2	3	4	5
I.	**Growth in Absolute Numbers**				
	i. Total population (in millions)	361	396	439	495
	ii. Total National Income at current prices (Rs. in millions)	95,300	99,800	141,400	202,500
	iii. Total expenditure on Education at current prices (Rs. in millions)	1,144	1,897	3,444	6,000
	iv. Total enrolment (000's)	25,543	33,924	47,964	70,292
	v. Total number* of teachers (000's)	804	1,107	1,508	2,169
II.	**Index of Growth**				
	i. Total population	100	110	122	137
	ii. Total National Income	100	105	148	212
	iii. Total expenditure on Education	100	166	301	525
	iv. Total enrolment	100	133	188	275
	v. Total number of teachers	100	138	188	270
III.	**Growth in proportions**				
	i. Percentage of Expenditure on Education to total National Income	1·2	1·9	2·4	3·0
	ii. Expenditure on Education per head of population (Rs.)	3·2	4·8	7·8	12·1
	iii. National Income per head of population at current prices (Rs.)	266·5	255·0	325·7	408·6
		Ist Plan	*IInd Plan*	*IIIrd Plan*	*All the three Plans*
IV.	**Average Annual Rate of Growth**				
	i. Population	1·9	1·8	2·4	2·2
	ii. National Income	0·9	7·2	7·5	5·2
	iii. Expenditure on Education	10·6	12·7	11·7	11·7
	iv. Total enrolment	5·8	7·2	7·9	7·0
	v. Total Number of Teachers	6·6	6·4	7·5	6·8

SOURCES: Form 'A' Ministry of Education, C.S.O., Planning Commission and Registrar General of India.

*Excludes teachers in Centres for adults.

TABLE 2

Average Annual Cost (Direct Expenditure) per Pupil in Different Types of Schools (1961–62)

S. No.	*State*	*Primary Schools*	*Middle Schools*	*High/Higher Secondary Schools*
0	1	2	3	4
1.	Andhra Pradesh	26·4	46·1	92·6
2.	Assam	23·9	55·6	91·4
3.	Bihar	17·0	31·9	61·0
4.	Gujarat	37·7	28·8	99·6
5.	Jammu and Kashmir	26·6	40·5	82·0
6.	Kerala	31·7	44·0	63·5
7.	Madhya Pradesh	40·1	59·7	126·5
8.	Madras	30·4	36·4	93·5
9.	Maharashtra	40·5	38·4	118·4
10.	Mysore	29·3	31·2	99·3
11.	Orissa	16·5	66·0	93·4
12.	Punjab	29·3	43·7	59·1
13.	Rajasthan	37·1	60·0	126·4
14.	Uttar Pradesh	20·0	49·7	101·1
15.	West Bengal	29·1	67·1	98·8
	INDIA	28·0	40·3	93·9

Source: Form 'A' Ministry of Education.

TABLE 3

Extent of Under-Reporting in Costs of Education in India (1950–51 to 1962–63)

(*In millions of Rs.*

S. No.	*Year*	*Combined Revenue expenditure of Centre, States and Union Territories*	*Non-capital expenditure from Government Funds as reported in Form 'A'*	*Difference*	*Col. (3) as percentage of Col. (2)*
0	1	2	3	4	5
1.	1950–51	610	595	15	97·5
2.	1955–56	1,104	1,036	68	93·8
3.	1960–61	2,152	2,007	145	93·3
4.	1961–62	2,605	2,363	242	90·7
5.	1962–63	2,788	2,619	169	93·9

Source: *Indian Economic Statistics* Part II, Ministry of Finance and Education in India Vol. II, Ministry of Education.

TABLE 4

ENROLMENT AND EXPENDITURE BY TYPE OF INSTITUTIONS IN SCHOOLS FOR GENERAL EDUCATION 1960–61

S. No.	*Type of Schools*	*Total enrolment (000's)*	*Total expenditure (000's)*	*Average annual cost per student (Rs.)*
0	1	2	3	4
1.	High/Higher Secondary Schools	7,512	689,117	91·8
2.	Middle Schools	10,610	429,220	40·5
3.	Primary Schools	26,643	734,461	27·6
4.	Pre-Primary Schools	121	5,873	48·5

SOURCE: Form 'A' Ministry of Education.

TABLE 5

WASTAGE IN THE EDUCATIONAL SYSTEM ON ACCOUNT OF DROP-OUTS AND STAGNATION 1960 61

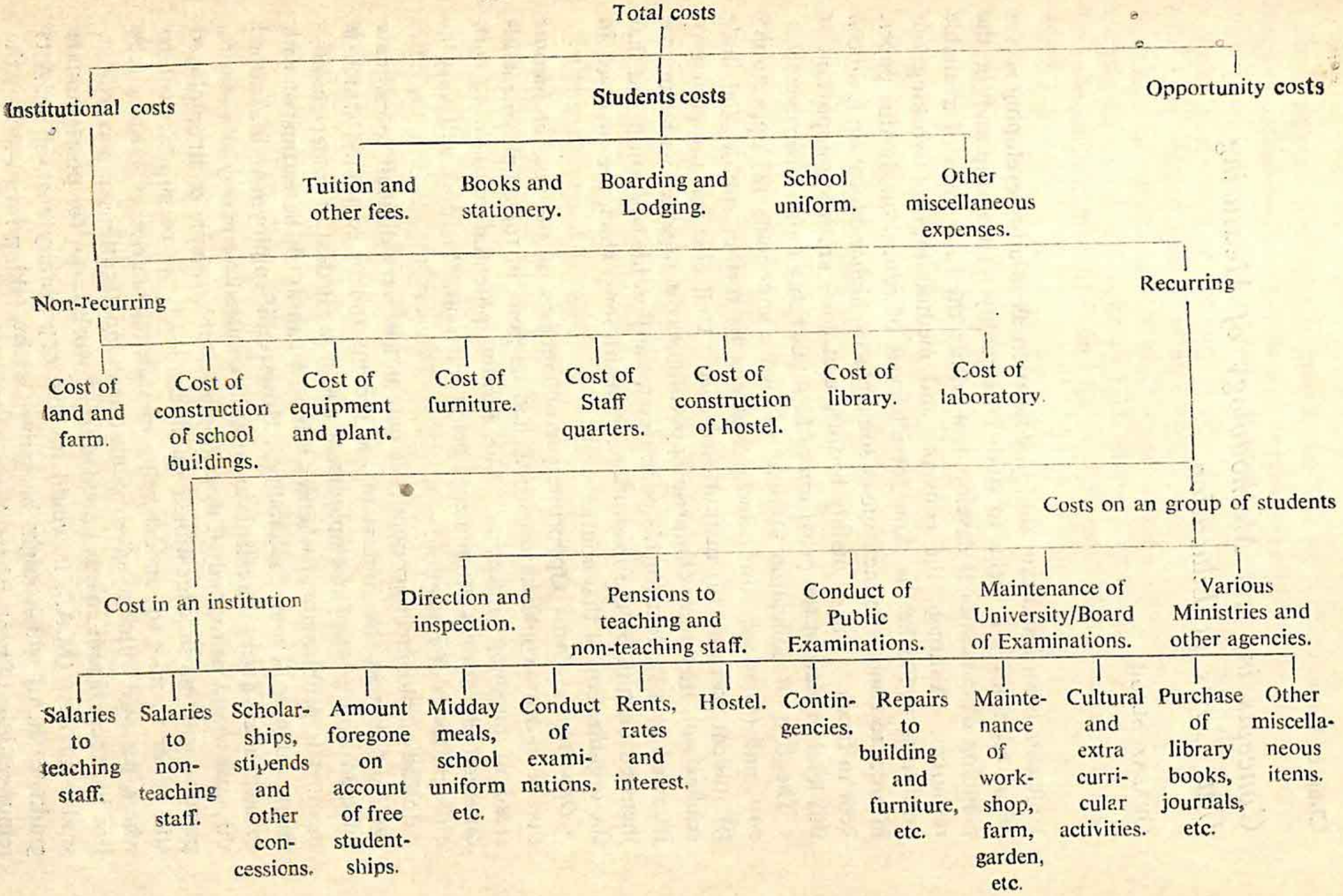
Year	*Class*	*Enrolment (000's) (E)*	*Stagnation Index (s)*	*E (1+s)*
1	2	3	4	5
1956–57	I	10,283	·42	14,601·86
1957–58	II	6,086	·31	7,972·66
1958–59	III	5,048	·24	6,259·52
1959–60	IV	4,248	·23	5,225·04
1960–61	V	3,611	·17	4,224·87
			Σ Ei (1+si)	38,283·95
1958–59	VI	2,208	·15	2,539·20
1959–60	VII	1,926	·15	2,214·90
1960 61	VIII	1,758	·14	2,004·12
			Σ Ei (1+si)	6,758·22

I. Primary Stage:
Actual cost (computed) Rs. = 27·5 × 38283·95 (thousands)
= 1,052·8 millions.
Desired cost Rs. = 27·5 × 5 × 3,611 (thousands)
= 496·5 millions.

II. Middle Stage:
Actual cost (computed) Rs. = 63·5 × 6758·22 (thousands)
= 429·1 millions.
Desired cost Rs. = 63·5 × 1758 × 3 (thousands)
= 334·9 millions.

APPENDIX I

Components of Costs on Education


Total costs
Institutional costs
Students costs
Opportunity costs
Tuition and other fees.
Books and stationery.
Boarding and Lodging.
School uniform.
Other miscellaneous expenses.
Non-recurring
Recurring
Cost of land and farm.
Cost of construction of school buildings.
Cost of equipment and plant.
Cost of furniture.
Cost of Staff quarters.
Cost of construction of hostel.
Cost of library.
Cost of laboratory.
Costs on an group of students
Cost in an institution
Direction and inspection.
Pensions to teaching and non-teaching staff.
Conduct of Public Examinations.
Maintenance of University/Board of Examinations.
Various Ministries and other agencies.
Salaries to teaching staff.
Salaries to non-teaching staff.
Scholarships, stipends and other concessions.
Amount foregone on account of free studentships.
Midday meals, school uniform etc.
Conduct of examinations.
Rents, rates and interest.
Hostel.
Contingencies.
Repairs to building and furniture, etc.
Maintenance of workshop, farm, garden, etc.
Cultural and extra curricular activities.
Purchase of library books, journals, etc.
Other miscellaneous items.

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Chapter Four

Concepts in, and Methodology of Measuring Unit Costs in Education

GURBAX SINGH

Unit cost is an important tool in education as in any developing sector of an economy. It helps to study cost-quality relationship and in the planning of educational development within the four walls of available resources. Although the concepts and methodology of working out unit costs would be the same for all levels of education, in this paper, in order to concretise the issue at some places, higher education has been kept in focus. This is mainly because unit costs are more important at this level in view of the provision of facilities being more expensive.

The cost of education consists of two components (*a*) opportunity cost, and (*b*) social cost. Social cost can be further sub-divided into: (i) student cost and (ii) institutional cost. Unit cost for any course of studies will, therefore, comprise opportunity cost together with the cost incurred by a student (or his parent/guardian) on his education and that incurred on him by the institution or institutions which are involved in the organization of that course.

Opportunity Cost. Opportunity cost consists of the loss of income that a student would have earned, had he gone in for employment instead of pursuing education. The earning potential of persons with different educational attainments being different, this cost will vary at different levels of education.

In full-employment economies it may not be very difficult to estimate this cost, but in the context of the present Indian economy, which is afflicted with a lot of unemployment and a great deal of under-employment, it is problematical whether this cost can at all be estimated with any reasonable degree of reliability. However, if employment is assumed in each case—a very unrealistic assumption, indeed—one way of assessing this cost would be to study it by taking a suitable sample of all employed persons with given educational qualifications. Or, perhaps it will be still better to take the model value of starting salaries of various jobs where persons with the given educational qualifications are recruited. For instance, if unit cost is intended to be worked out for post-graduate studies in Arts (M.A.), it would involve opportunity cost of an Arts graduate (B.A.) which might be arrived at by taking into account the remunerations of posts where Arts Graduates are usually employed.

Student Cost. Student cost consists of four parts (*a*) tuition and other fees, (*b*) cost of books, equipment and stationery, (*c*) cost of maintenance (board and lodging), and (*d*) other sundry expenses.

Fees. It consists of the tuition fee, laboratory fee, examination fee, admission fee and other fees and charges that a student has to pay to the school or college and to the other educational authorities concerned, such as the Board of Secondary Education or the University. However, it would exclude hostel fee and hostel charges as well as all refundable security deposits.

Since this payment on the part of the student becomes the income of the institution which is again spent as part of the institutional cost, it has to be omitted from one place while calculating the overall unit cost to avoid double counting.

Cost of books, Equipment and Stationery. The items which go under this head are obvious and easy to evaluate. This head, therefore, needs no further explaining.

Maintenance. As regards maintenance, the students can be divided into two categories: (*a*) hostellers and (*b*) day-scholars. The day-scholars can be further divided into two parts: (i) those who stay with their parents, and (ii) those who make their own arrangements outside the hostel. The cost of maintenance of all these categories will be different. For hostellers, it is easy to arrive at a correct estimate of cost, but it is not so easy in the case of day-scholars of either description.

In this context it is also questionable whether this cost should at all be taken into account because the student would, in any case, have to maintain himself or be maintained by his parent or guardian whether or not he is receiving any education.

Other Sundry Expenses. These include clothing, pocket money, entertainment and other miscellaneous expenses. The cost of these items would vary considerably according to individual tastes and habits and the economic status of the student or his parents. One way of estimating it will be to have a sample survey, after identifying items to be considered under this head, and taking the model value.

Institutional Cost. Institutional cost can be divided into two parts (i) non-recurring, and (ii) recurring. The non-recurring cost can be further sub-divided as: (i) capital cost, and (ii) equipment cost. Similarly, recurring cost can also be divided into: (i) non-divisible, recurring cost, and (ii) divisible recurring cost.

Non-recurring Cost—Capital. It includes the value of land and buildings of the school or college, hostels, staff quarters, library, laboratory, hospital if any, etc.

In this case, one could take the annual depreciation or amortization cost into account to be distributed equally over all the students under instruction in the institution. But since sometimes there is appreciation in the value of land and buildings in course of time, it would be better if the rental value, of the buildings is taken into account instead of their annual 'depreciation'.

Non-recurring Cost—Equipment. This should include items like stock of library books, laboratory equipment including gas plant, printing press if any, and so forth. The annual recurring expenditure on the purchase of books for the library, consumable store for the laboratory, etc., will, however, have to be omitted from here as these items, which form part of recurring cost (non-divisible), are being considered in a subsequent paragraph.

The annual amortization cost of the stock of books in the library and the equipment in the laboratory, etc., distributed equally over the entire student body receiving education during the course of the year, would provide the unit cost on this account.

Recurring Cost. As already said, recurring cost can be divided into two parts—non-divisible and divisible. Non-divisible cost would comprise those items of expenditure which are incurred for providing common services to all the students of the institution and as such should be equally shared by them from the point of view of the unit cost. For instance, salaries of administrative staff, contingent expenditure, etc. Divisible cost, on the other hand, may be defined as the expenditure which is incurred for providing services to a group or part of the student body and as such the expenditure is to be distributed over the members of this group only to calculate the unit cost on this account. Items like recurring expenditure on consumable stores for the laboratory (which is for science students only) or the recurring expenditure on the school bus, etc., are the cases in point.

It is difficult to be precise about the allocation of items of recurring expenditure under one or the other sub-head—divisible and non-divisible —because the same item would fall under the first sub-head in one type of course and under the second in the case of a different course. For instance, expenditure on salaries of teaching staff may be non-divisible in a primary school and divisible in a University teaching department or a college, or recurring expenditure on the purchase of library books may be non-divisible when the books are meant for the University library and divisible when these are meant for the library of a teaching department, and so forth. In order, however, to clarify matters, a broad classification of recurring expenditure between these sub-heads is given below : However, it would be advisable to consider each item on its merits in the context of the given situation.

Recurring Cost—non-Divisible. It would cover the following main items: (i) salaries and allowances of administrative and establishment staff, including library staff; (ii) gratuity, pension, provident fund contribution and insurance of the entire staff; leave salaries of the staff; (iii) annual purchase of library books, periodicals, journals, etc., (iv) expenditure on extra-curricular activities like gymkhana, library, N.C.C., contribution towards running of hostel, organization of social functions, etc.[9] (v) rent, interest and administrative charges, (vi) rates taxes, electric and water charges, (vii) current repairs to buildings, furniture, etc., (viii) contingent expenditure like postage, stationery; (ix) expenditure on organizing examinations; (x) scholarships, stipends and freeships; (xi) miscellaneous recurring charges.

Recurring Cost—Divisible. The main item under this head would be: (i) salaries and allowances of teaching staff, (ii) recurring expenditure on science laboratories, (iii) expenditure on the school bus, etc.

Sometimes there arise complications in calculating unit cost due to the administrative organization of the course in question or the institution concerned. For instance, a postgraduate course may have federal teaching by various colleges and also by the university or again a college may have provision for both postgraduate and undergraduate courses in various faculties and sometimes it may have even attached classes in faculties alien to the main character of the institution (e.g., an arts and science college having classes in agriculture or teacher training). Here, the allocation of the recurring cost in suitable proportions to different courses has to be done very carefully and one cannot just go by averages or pro-rata proportional distribution of expenditure without involving risk to the accuracy of the results.

Chapter Five

Educational Costs : Concepts and Issues

H. VENKATESHWAR RAO*

Introduction

The studies on unit cost of education undertaken by about 12 Universities in India at the instance of the Education Commission, Government of India revealed the necessity of formulating a generally accepted and uniform methodology for conducting such studies. It was precisely with this objective in view, that a seminar on *Unit Cost Studies in Higher Education*[1] was arranged. The seminar afforded the delegates an opportunity to discuss several issues relating to the concept of costs on the basis of the studies, and to make some useful recommendations. But seminars and conferences cannot fully solve the problems. At best they are supposed to provide guidelines for further research into the nature and scope of the problem in question. In this paper attention is mainly focused on the analysis of the concept of the cost of education in particular higher education, in its different aspects. The operational significance of these aspects in the context of an underdeveloped economy like ours is also discussed. In the section below, however, certain economic aspects of education, have been considered since they are believed to have a definite bearing direct or otherwise, on the costs of education.

Some Economic Aspects of Education

The economic aspects of education like the costs, benefits or the rate of return did not sufficiently engage the attention of the classical and neo-classical economists.[2] They accorded only a peripheral importance to economic considerations of educational activity. They also treated educational expenditures as 'social investments' and allowed them to be determined residually.[3] Similar appears to be the attitude of our central and state governments these days towards education. This is evident from the fact that allocations to education get curtailed in the first instance whenever any measure for 'economy drive' or pruning of the plan is undertaken. Such an attitude springs from the non-recognition of the intimate relationship existing between education and economic growth.

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*The author is grateful to Dr. Gautam Mathur, Dr. R. J. Chelliah, and Dr. N. S. Iyengar for their guidance in the preparation of this paper.

[1] The Seminar on *Unit Costs of Higher Education* sponsored by the Education Commission, Government of India, was held at New Delhi on the 19th and 20th March 1966.

[2] Adam Smith, J. S. Mill, and Alfred Marshal have no doubt recognized the importance of education as national investment; but as T. W. Schultz puts it, the early masters provided no systematic treatment of education. For the views of economists on education see John Vaizey, *The Economics of Education*, pp. 15-25.

The reasons for indifference towards economics of education on the part of the early economists arise from their feeling that they cannot be impartial and objective in the treatment and analysis of an all-embracing subject like education.[4] Further the notion that economics is materialistic or that the labour is capital-free is a direct consequence of the failure of the economists including the modernists to treat the acquired abilities and skills of man as a form of capital. And it is the process of education[5] that contributes to the formation of a spectrum of skills and abilities known as 'human capital', a major explanatory variable in economic growth.

During the past decade or so there has been an increasing awareness of the importance of human capital, as a produced means of production, and as a residual factor in economic growth. This feature is evident in the works of T.W. Schultz and other American economists who also asserted that key investment in human capital is education. The accumulation of human capital can also be achieved through other ways[6] than education in its formal sense. Through on-the-job informal training, self development, and improvements in health and nutrition, human resources can also be developed albeit education as mentioned above is a major factor in the growth of human capital. Thus economics of education—more particularly investments in education is now included in the main stream of economic analysis. The principal approaches in this regard, are (i) Determination of the relationship between expenditure on education and growth in income or in physical capital formation over a period of time in one country; (ii) The residual approach in determining the contribution of education to Gross National Product; (iii) Calculation of rate of return from expenditure on education; (iv)

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[3] F. Harbison and C. A. Myers, *Education, Manpower and Economic Growth*, p. 11.

[4] T. W. Schultz, *Economic Value of Education*, p. 1.*

[5] ‘The process of education is described in a stylized fashion. A number of factors of production including land, buildings, teaching staff of particular importance "The primary labour input", the student are integrated over a certain gestation period to produce a bundle of physical and intellectual skills to be known as the *machine*'. Stephen Merrett, 'Student Finance in Higher Education', *The Economic Journal*, Vol. LXXVII No. 306, June 1967, p. 288.

[6] F. Harbison and C. A. Myers, *Education, Manpower and Economic Growth*, p. 2.

Making inter country correlations of school enrolment ratios and GNP and (v) Determination of relationships between educational plan and economic plan. The first four approaches are discussed by Professors Harbison and Myers[7] while the fifth approach, which aims at integrating every aspect of the over all economic plan with that of the educational plan, is enunciated by Professor Gautam Mathur.[8]

The Costs of Education

The expenditure on education[9] is an important item of a nation's budget in view of the intimate relationship between the quantum of technical skills and abilities and economic growth. Whether it be capitalistic or socialistic, a country has to devote a sizeable part of its resources towards education. In the two polities one capitalist and the other socialist, the educational outlays will remain the same if these economies are identical in all other respects of factor endowments and economic goals. The differences between them would however be in the methods of meeting their costs and modes of production. In a purely a capitalist economy, probably purer than U.S.A.; all capital whether human or physical is private owned. The young student meets his costs of education from different sources, like familial financial support, familial real income support, self finance from part-time work, to maintain himself and to purchase education. After the successful completion of an educational career, he hires the *capital-component* (machine) of his personality, out to the rest of the business world, and uses the income, received, to repay the debts, to reimburse family and to maintain himself, may be at a higher standard of living. In the socialist society, on the other hand, the State owns all capital and pays the costs of education including wages of the 'primary labour unit' called the student. The 'machine' is later rented out to the publicly owned companies which pays for its use directly to the State Bank.[10] There is so another method according to which educational institutions act like business firms which transform 'primary labour inputs' into a skilled manpower. Under such a scheme of things one need not depend on state grants and subsidies, contributions from philanthropic organizations and bank loans etc. The costs of education will be completely met by the schools and colleges which would engage themselves in the production, purchase and sale of *human capital*.[11] The types of economies considered above are the two extremes on a 'distance scale' and the real situations lie in between them.

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[7] F. Harbison and C. A. Myers, *Education, Manpower and Economic Growth*, p. 5.

[8] Gautam Mathur, *The Economic Principles of Long-term Educational Planning* (Mimeographed).

[9] T. W. Schultz makes a distinction between schooling and education. The former refers to the educational services rendered by elementary and secondary schools and institutions of higher learning including the efforts of the students to learn; education on the other hand is a wider concept, denoting a set of activities of which some are organized (like education in schools) and some are essentially unorganized. This term is used by Machlup to include not only acquisition of knowledge in the schools and colleges (formal education) but also education in home, church and in firms consisting of on-the-job training, etc. But the term, cost of education in this paper means the cost of formal education. The enormous difficulty in estimating the cost of informal education however is too obvious to explain.

The costs of education in whichever country, incurred, possess two inseparable attributes—consumption and investment. One can never separate out and say that this is the consumption component of the educational costs and the rest towards education as an investment. It is because education is a closely integrated process and, therefore, does not permit any such segregation. The difficulties of segregation should not lead one to deny the existence of these components. In a situation, where for an individual cost of one-year schooling is an alternative to the expenditure on foodgrains in that year, the expenses on education is a consumption expenditure. Because, in this situation the individual is faced with a choice between purchase of foodgrains and going to the school, which ever yields immediate benefits. When education is viewed as a process of manufacture of skills and talents appropriate to the needs of a growing economy the outlays on education, possess more of an investment attribute. The popular notion[12] that expenditure on technical education is an investment and that on general education a consumption has no scientific validity. Similar is the view that the public outlays on education is an investment while private expenditure on it a consumption.

Broadly speaking there are two components of the costs of education, costs borne by the students and costs not borne by the students. Another approach to this problem is to conceive of costs of education as having three different aspects—(i) Institutional costs; (ii) Students' costs and (iii) Opportunity costs. One can however consider opportunity costs as a component of total students' cost since the latter can be interpreted to mean a sum of students' costs incurred (on books, equipment maintenance, etc.), and the earnings of the students foregone. The institutional costs include monies spent by the educational institutions either from its regular budgets or from grants and donations received through autonomous and philanthropic and other institutions. Grants and scholarships made over by institutions to the students directly are also treated as forming a part of institutional costs. If we closely examine the constituent items of both students' costs and institutional costs it will be found that items like examination fee, hostel expenses appear in the two groups. As long as these categories are treated as two aspects, occurrence of the same item in the groups does not constitute a problem. However, for computing social costs of education these two aspects have to be aggregated after taking care to avoid duplication of any of the constituent items. Once this problem is taken care of, these two aspects can be treated as components of total educational costs.

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[10] For a clear exposition of the processes of manufacture of human capital and their limitations in the types of societies see Stephen Merrett, 'Student Finance in Higher Education', *The Economic Journal* Vol. LXXVII No. 306 June, 1967, pp. 288–293.

[11] Gautam Mathur, *The Valuation of Human Capital for Manpower Planning*.

[12] Department of Foundations of Education, *Monograph on Plan of Studies in Economics of Education* by H. N. Pandit, p. 21.

The institutional costs can be divided into two parts, (i) Non-recurring costs; (ii) Recurring costs. Non-recurring costs can be further subdivided into capital cost and equipment cost. The capital cost includes the cost of land, buildings, library, laboratory, etc., while the equipment cost represents the services rendered by library and laboratory equipment. The recurring costs can further be divided into (i) Divisible and (ii) Non-divisible depending upon whether the items can be clearly allocated and earmarked between different courses and faculties.

The students' costs can be divided into the following parts: (i) tuition and other fees; (ii) cost of books; (iii) cost of maintenance; (iv) checking and other miscellaneous expenditure and (v) opportunity cost, which represents forgone income which would have been caused by the students, if they had engaged themselves in some direct or indirect productive activity instead of attending the school or college. For a clear analysis and tabular representation of the components of various cost streams of educational costs, the reader's attention is invited to the educational cost diagram.[13]

Let us consider opportunity costs. This component of costs was neglected in almost all studies on the costs of education, until Professor T. W. Schultz introduced these elements of hidden costs in his estimates[14] for the United States. Students in secondary schools and beyond, and most of them before they complete elementary stage of education, could be earning at jobs suitable to their age and experience. If it is assumed that they do not study in schools they would have been employed in those jobs and got paid. These earnings which students forego to continue their studies in schools are termed opportunity cost or earnings foregone, which offers a unified and consistent explanation for a number of puzzles related to education.[15]

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[13] Department of Foundations of Education, *Monograph on Plan of Studies in Economics of Education*, p. 9.

[14] T. W. Schultz, 'Capital Formation by Education' *Journal of Political Economy*, December, 1960, p. 573.

As noted earlier many studies on educational costs omitted this item from consideration. Vaizey in the *Costs of Education in U.K.* covers both public and private costs in a much needed historical perspective. His estimates suffer from certain limitations one among which is the omission of earnings foregone. Schultz gives reasons for the neglect of this important component of educational costs. Cultural history of nations explains this omission. Throughout the most of Western Europe secondary schooling has served mainly to prepare a small group of people for higher education and the functions of the university have been to prepare students for particular elite roles. These students few in number came from families who did not expect their children to join the labour force. Such families could afford leisure for themselves and their progeny. These elite expectations must have made it difficult for them to realize that students must be foregoing earnings while attending schools.

But the opportunity cost though theoretically a sound concept and accounts for large percentage[16] of total cost of education, is difficult to estimate. Vaizey points out the limitations of the method of calculating of earnings foregone. Part-time earnings by the students and the influx of new workers would reduce the average wage rates of workers of comparable age and status because these people have to compete with the new entrants for jobs. Further the rate of unemployment will be higher if more people compete for jobs on account of continued influx of new workers. These factors render the calculations of opportunity cost extremely difficult.[17]

From the above it is clear that the cost of higher education is a very complex variable. Viewed rather broadly this concept can also be interpreted to include non-monetary costs such as burden of study and for some students the pain of being away from home.[18] However, we believe that the quantification of these non-monetary aspects is an intractable problem.

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[15] T. W. Schultz, *Economic Value of Education*, pp. 6, 30.

[16] In the two higher income countries of U.S. and Israel the earnings foregone accounts for 59% and 54% respectively of total costs of higher education per student. In the low income countries of Mexico and Venezuela also the opportunity costs account for 57% and 71% respectively of the total costs. T. W. Schultz, *Economic Value of Education*, see Table 1, p. 29.

[17] John Vaizey, *Economics of Education*, pp. 49, 50.

[18] 'The Demand for Higher Education in the United States, 1919–1964', *The American Economic Review*, Vol. LVII, No. 3, June 1967.

In view of the prevalence of different aspects and definitions of the 'cost of education' which includes a multitude of items; it is always safe to define clearly the scope of cost (which are relevant items and which are not) before proceeding to obtain a measure of it. For example, expenditure on school/college library is included in the scope while the amount spent on public libraries is not, though the student may make use of both of them equally. Due to the differences in the scope of costs of education, various governments might give various estimates of costs in spite of total expenditure actually incurred on education in each country being the same. A country in which many schools and colleges are under the control of government will give higher estimates than a country in which many schools and colleges are run by private bodies, despite the total number of schools and colleges in the two countries remaining the same. This is because public expenditure enters into official statistics while private outlays do not. Another such instance is that the estimates of costs provided by private schools would be lower than those of public schools due to a simple reason that private schools do not include grants and donations in the scope of costs. Hence whatever may be the concept of cost, used (student cost, or institutional cost) the definition of its scope should be clear unambiguous and invariant with respect to time and place; if meaningful comparisons are to be made from year to year or country to country.

It is not out of place here to refer to certain items whose inclusion into the scope of costs is rather of a controversial nature. Firstly, Prof. Schultz is not in favour of including the cost of university research in the factor costs of schooling because of the fact that the university research does not directly serve instructional purposes. This position may not be entirely defensible. The costs of research in institutions of higher learning cannot successfully be separated from teachers' salaries as teachers do research[19] in addition to teaching as a part of their duty. Another item over which the opinion is divided relates to students' maintenance cost, whether the scope of cost should include total maintenance expenditure or the differential living costs incidental to education ? In the capitalist and socialist models considered in the beginning of this section, total maintenance costs are treated as a part of educational outlays. The reason given by Schultz against the inclusion of total maintenance expenditure is that the economists generally omit costs on food and clothing, etc., when they calculate labour costs of an industry. Another reason is that students whether they go to school or not will have expenditure on food and clothing. Therefore, whatever additional expenditure is incurred due to education, only that should be included in the cost calculations. Lastly, there is the question of auxiliary services; like printing press and hostels, etc., whether the costs incurred on such services should be included or not ? While some economists pleaded for the exclusion of the costs of such services, others maintained that the net expenditure[20] (total costs—receipts from the sale of products) on such services should be included in the institutional costs.

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[19] One of the declared objectives of the U.G.C., Govt. of India, is to encourage the combination of research and teaching. These two aspects which are complementary, enrich one another due to such a combination.

Costs of Education in Under-developed countries

According to the composite index[21] of levels of human resource development, India falls into the group of semi-advanced countries. These countries by and large can produce the high level manpower they need except of course technical and scientific personnel. They also export manpower to less developed countries. In the field of scientific and technical education, there is still a wide gap between the advanced and semi-advanced countries.

The above remarks will not strictly apply to our country although for the group as a whole they may hold good. Ours is more a developing economy with its characteristic problems. In countries such as ours, there is not only a shortage of scientific and technical skills but also paucity of physical capital.

The quality and content of education (very less indeed) in these countries tend to be traditional and unrelated to economic needs and aspirations of the people. Further education is also found to be inefficient and very expensive in these economies. Therefore, the under-developed countries must thoroughly reform their educational system to make the latter appropriate for fulfilling the declared objectives. On account of this and other reasons[22], as the country proceeds on the path of economic development total costs and costs per student show a rising trend. Thus educational expenditure in under-developed countries can be treated largely as a matter of investment because the State which bears a huge part of the social costs of education under planned programmes, encourage the production of only those skills which would be in great demand and which also have a huge gestation period.

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[20] This view had been accepted at the Seminar on Unit Costs of Higher Education held in New Delhi during March, 1966.

[21] F. Harbison and C. A. Mayers *Manpower and Economic Growth*, *op. cit.* p. 33.

[22] The other reasons causing the costs to rise are:

- *a.* Provision of education to the ever-increasing population.
- *b.* Huge wastage of materials and skills which is likely in the initial phase of development process.
- *c.* Economic development calls for superior and latest skills, the acquisition of which implies purchase of costly equipment and appliances.
- *d.* Due to introduction of advanced courses size of the classes have to be reduced and this gives rise to more number of highly qualified teachers.
- *e.* As a nation grows richer it can afford to spend more. J. Vaizey, *The Economics of Education*, p. 55.

It has been noted in the earlier section that the social cost of education is the sum of institutional, student and opportunity costs. When we come to under-developed countries social cost of education is only a sum of institutional and students' costs. The concept of opportunity cost however seems to have a doubtful validity in this context. On account of the inclusion of opportunity costs, the estimates of total costs will be boosted up and the resulting estimates would not provide the correct money value of the resources spent on educational activities. But it has been argued that the opportunity costs should be included as a constituent item of total costs for those areas or regions where government or a similar agency, makes payment to the poor peasants to induce them to send their children to school. The payment should be at least equivalent to the alternative earnings of the children on the farms. According to this view, freeships and other kind of monetary assistance given to the students of backward classes and scheduled tribes forms a part of opportunity costs. The problem which arises in this connection is: Do the children of poor farmers in under-developed countries really add to the production on farms where the marginal productivity of labour is zero ? It is true that the children do go to farms at an early age. It also true beyond doubt that their parents derive a false sense of satisfaction from the belief that their sons have become earning members of the family. But the fact of the matter is that their contribution to the farm production is extremely negligible. Under these conditions if at all the payment is made by the Government to the farmers it is merely to induce them to send their children to schools and not to compensate the loss in production resulting from the withdrawal of the child. Hence, in labour-redundant under-developed economies, characterized by widespread unemployment, underemployment and non-employment; the opportunity cost of matriculates or other students will be equal to zero, for they would have added themselves to the pool of unemployed had they not prosecuted their studies. Thus on the whole there is a stronger case for the omission of opportunity costs[23] in the situations portrayed above, although this issue is not yet completely settled.

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[23] This view emerged from the discussions at the seminar on Unit Costs of Higher Education held in March 1966 at Delhi.

Concluding Remarks

The costs of education, whatever may be the aspect under consideration, vary with the scope—the wider the scope the greater the estimate. In spite of unambiguous and scientific classification and definition of various components of the cost of education, it is not possible to obtain an accurate measure of total costs which include a multitude of odd items starting from current outlay to estimates of opportunity and non-monetary costs. Almost every item will give rise to some computational difficulty or the other. Hence, an investigator should aim at a satisfactory feasible estimate of costs rather than an ideally accurate figure.

The allocation of costs of education between consumption and investment remains one of the unsettled issues even to this day. Whatever allocations attempted, so far have been only arbitrary in the sense that no logical basis for such allocations has been presented for others to follow. In practice while estimating the rate of return to education the total expenditure on education is treated as investment. The direct consequence of this procedure will be to lower the rate of return. So any study, providing a reasonably scientific basis for determining consumption and investment components of total costs of education, will be a fundamental contribution to this area of research.

Finally, there is an important problem of the definition of a unit in conducting cost studies. It is usual to compute institutional cost of education per student per year for purposes of comparison either between two or more universities or between two or more institutions of the same university. Further, it is claimed that these estimates in which a student is treated as a unit, give costs incurred to create and maintain a seat of higher education.[24] The problem that arises is: Is this a satisfactory unit for comparative purposes in these days of rapid expansion of educational facilities ? The other alternatives may be to adopt, 'duration of a course of study', or 'an institution of certain stipulated size' as a unit. Here the problems of defining an optimum institution turning out the optimum products seem to baffle any solution and one has in this context to rely on the theory of good education, to be propounded by eminent educationists. The choice of a particular unit however depends on the purpose of the planners. In estimation of outlays for universal primary or secondary education 'an optimum institution' may be a more appropriate unit. In the matters of attainment of targets of skilled manpower of various scientific and technical categories, duration of professional course as a unit might be considered more relevant. Implied in the definitions of the units, is the consideration of cost-quality-size relationship.

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[24] A. R. Kamat, 'Unit Institutional Cost in Higher Education—A Study in Method, *Artha Vijnana*, Vol. 9, No. 1, pp. 92–105.

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Chapter Six

Private Costs of Elementary Education

K. R. SHAH*

The Education Commission, in its Report, has made two important observations regarding the financial burden of the two important private costs of education; namely, (i) tuition cost and (ii) the cost of books and stationery.

The Commission observes that tuition fees are the most regressive form of taxation, fall more heavily on the poorer classes of society, and act as an anti-egalitarian force. Secondly, 'The private costs of education required for textbooks, supplies, co-curricular activities, etc., have increased very substantially in recent years, and amount, not infrequently to several times the tuition fees. In fact, the non-egalitarian trends to-day is not so much the tuition fees as these other costs.'[1]

The Commission goes on to suggest (i) that education in India should be gradually made tuition free and (ii) that the books should be provided free of cost or at reduced rates or grants for the purchase of books should be given to the university students to start with.

The above observations and recommendations of the Commission will, no doubt, have an important bearing on the system of educational finance in India. As the Commission itself has pointed out, 'taking an overall view of the situation, therefore, it appears that the funds of the central and the State governments would have to bear about 90 per cent (or even more) of the total educational expenditure.'[2]

Since a long time low tuition fees or no tuition fees is used by the States as their main weapon of insuring educational opportunities. In recent years, attention has been given to the costs other than tuition charges, and policy issues regarding financing education have linked tuition charges and scholarships.

The relevant questions to which answers are sought in this chapter are (i) What is the composition of the private costs of education ?

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[1] See *Report of the Education Commission 1964-66*, 'Towards equalization of Educational opportunity', Chap. VI, pp. 111-113, Ministry of Education, Government of India.

[2] *Ibid.*, 'Educational Finance', Chap. XIX, p. 472.

(ii) Whether the burden of the private costs of education varies for families of different income groups, if so, to what extent ? (iii) What proportion in the private costs of education, especially tuition cost, is covered by aid to students ?

In answering these questions one can say whether or not the Education Commission was justified in making the aforesaid recommendations.

Our main attempt will be to measure the private costs of education for families at various levels of income.

Private costs of education are known as private because they are borne by students themselves or by their families, i.e., burden of such costs falls on them as they finance them.

Expenditure on education by public bodies and that on tuition fees by private persons can be readily obtained from Government publications. But little information is available on direct costs other than tuition cost incurred by private persons on education.

For estimating the burden of the cost of education on private persons according to their economic status, the existing state of knowledge on the subject is even worse.

In these circumstances, we decided to conduct locally a small survey to get some idea of the magnitude involved.

This chapter is based on information collected in a survey of ten per cent of the students of the Faculty of Commerce, University of Baroda, conducted during the period, October 1966 to December 1966.

Out of a total number of 129 students to be interviewed, as many as 125 were contacted. Where necessary, the students, parents were contacted to fill in the gaps in information required by our survey.

Students were asked to provide information principally under the following major heads:

a. Expenditure on education incurred by the family to which the student respondent belonged at all stages of education during the academic year 1965-66, not only on the student respondent but also on other members of the family still in school or college.

b. Economic, social, and educational backgrounds of students' families.

c. The source and the amount of aid, if any, received towards the expenditure on education, and

d. Views of students on existing tuition rates and preferences to continue education without financial aid.

The concept of 'annual family income' used in our study covers not only the annual earned or unearned income, (i.e., income from property) of the persons who finance their education but also the annual earned incomes of other members in a joint family; incomes of those who live independently or away, but who help their parents, have also been taken into account. Even the students who finance their own education, have to depend on their families for other expenses. In the case of such students there is no familial financial support, but familial real income support. In our study, we have come across students who are earning and still their educational expenses are borne by their parents.

In the case of students' families where there are more than one earning member, education is mostly financed by the head of the family—in most cases the head is the father. As such, the annual income, from all sources, of a head, in fact, is to be taken into account. Earnings of other members are included mainly because students have the additional facility of drawing funds when required.

The limitations of our inquiry are many. We list here its principal limitations. Ours was purely a case study rather than a nation wide representative sample. Secondly, our field of inquiry was confined to a faculty of one university of a State in the country. Thirdly, most of the students for whom data were collected belonged to general education schools and colleges rather than to professional education schools or colleges. For instance, out of 157 students studying at the third level of education, only 13 are in professional higher education colleges. Cost-structure of general school and higher education students is bound to be different than that of professional secondary and higher education students. Fourthly, composition of student body in our study is more in favour of students coming from comparatively better economic position. This is so as our respondents are the university students. Proportionate representation of students belonging to families at various levels of income would have been different if all students (or a representative sample of them) at the school stage had been interviewed.

However, our study has, as is shown below, some semblance of a representative sample.

i. In 1960-61, of the total number of students at the first stage in India, 75 per cent and 25 per cent went to government schools and private schools respectively. Of the students at the elementary stage in our sample of families, 78 per cent of students whose annual family income is upto Rs. 3,600, go to tuition free municipal schools and 22 per cent to private schools. However, the proportion going to government schools is 11 per cent only when students of the income group, above Rs. 3,600, are considered.

ii. Both at the secondary school stage and at the higher education stage, the proportion of students in general schools and higher education colleges and universities is very high as compared to that in professional schools and colleges for the country as a whole. In 1960-61 nearly 4/5th of the students in the higher education stage were in universities and colleges for general education. Nearly 90 per cent of the enrolled students at the second level of education were in non-professional schools in 1960-61.

iii. For the country as a whole, in 1960-61, out of 9·1 lakh students in institutions of higher education only 3·6 lakhs or 37 per cent came from rural areas. In our study also students from rural areas at the third stage account for 40 per cent of the total.

iv. The proportion of students at the third stage staying in hostels is 22·3 per cent in our study whereas it is 18·4 per cent in 1960-61 for India as a whole.

v. According to our sample, nearly 70 per cent of the students at the higher level of education come from families with income above Rs. 3,600. This again might be said to represent the pattern which prevails in the country as a whole.[3]

All the above points go to show that though ours is a case study limited in scope and coverage, it sconclusions might be of significance in the wider context of the country as a whole.

In order to have an idea of the burden of the costs of education on families of different economic status, students' families in our sample had to be classified into various income groups. On the basis of the information collected regarding 'annual family income', we classify below the students' families into five income groups.

S. No.	*Income Group (Rs. per year)*	*Number of Students' Families*	*Number of Students in a Family According to Level of Education**		
			a *Elementary*	*b* *Secondary*	*c* *Higher*
0	1	2	3	4	5
1.	1– 1,800	20 (32%)	23 (21)	14 (13)	22 (21)
2.	1,801– 3,600	20	21 (20)	14 (14)	22 (22)
3.	3,601– 6,500	27 (68%)	32 (27)	22 (19)	36 (35)
4.	6,501–15,000	27	24 (15)	22 (13)	44 (38)
5.	Above 15,001	31	35 (28)	19 (9)	48 (41)
	Total (1 to 5)	125 (100%)	135 (103)	91 (68)	172 (157)

Note: Refers to families of students interviewed, i.e., university students only.

*Figures in brackets in sub-columns *a*, *b* and *c* to such students who have supplied information about their costs of education.

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[3] *See*, J. P. Naik 'Objectives of educational development', *Manpower Journal*, Vol. I, No. 2, 1965 published by the Institute of Applied Manpower Research, New Delhi. He writes 'but from the few studies that have been conducted in some parts of the country, there is reason to conclude that the facilities for secondary and higher education are very largely utilized at present by boys, by the urban people, by the middle and the upper classes, by the services and by the people in the upper ten percent of the population'.

From the above table it can be seen that only 40 families or 32 per cent belong to an income group of Rs. 3,600 and below whereas 85 families or 68 per cent belong to the income group of Rs. 3,600 and above. This indicates that, students from high income group families dominate our sample[4]. 74·4 per cent of students at the third stage belong to a higher income group, i.e., of families with an annual income of Rs. 3,600 and above, whereas only 25·6 per cent belong to a lower income group. We get a more or less similar picture of a relatively high proportion of students belonging to high income group both at the elementary and secondary level of education. 67 per cent and 69 per cent students at the elementary and secondary stages come from high income group respectively.

While the distribution of students in our sample appears to be reasonably representative with respect to the third stage, that fact itself has introduced a bias in favour of the higher income group when it comes to students from our sample of families going to the first and second stages.

There can be no doubt that students from lower income group comprises the majority at the elementary stage and that even at the secondary stage of education, their relative strength should be higher than at the third level of education. Our inquiry's results with respect to the first and second stages will therefore be inapplicable in the general setting of the country as a whole unless we make the necessary corrections on the basis of whatever relevant all-India information about the economic distribution of students at these two stages is available.

As has been stated earlier, our inquiry's results above are not strictly applicable to the all-India situation in view of the bias in our sample in favour of high income group at the elementary stage.

Now, we know that the distribution of students between private and municipal elementary schools is in the ratio of 25 to 75. If one ventured to use our results along with the all-India distributions of elementary stage students between private and municipal schools one could hazard an estimate of the distribution of students at this stage between high income and low income families.

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[4] In this connection it is highly significant that the economic picture for the entire student population of the university of Baroda in the year 1957–58, as revealed in a sample survey then conducted was, as can be seen from the Table below, very close to the picture revealed by our 'partial' survey of the students of this University in 1965–66.

S. No.	*Income Group (Rs. 3,001 to Rs. 6,812)*	*Economic Status*	*1957–58 Percentage of Students' Families*	*1965–66 Percentage of Students' Families*
0	1	2	3	4
1.	Rs. 3,000 and below	Low	30·5	28·8
2.	Rs. 3,001 to Rs. 7,812	Middle	44·5	32·8
3.	Rs. 7,813 and above	High	25·0	38·4

SOURCE: *See* B. V. Shah, *Social Background of Students of the M.S. University of Baroda* (Unpublished, Ph.D. Thesis).

Note: We have reclassified students' families in our sample as shown above in order to make it comparable to the classification made by B. V. Shah.

If the more recent survey can be taken as any guide, it appears that the representation of lower income groups in the university student population, contrary to the general impression, has gone down.

The third level of education is, even to-day, largely dominated by students of middle and high income groups. No less interesting is the increase, over the period, in the proportionate representation of families of high income group and fall in that of middle income group. That this has remained so despite the tremendous increase in the scholarship and freeship expenditure over the last decade and a half in the country, must raise questions which could be fruitfully taken up for research.

The distribution of students at the elementary stage in our sample of families was as under:

S. No.	*Income Group (Rs. per year)*	*Students in Tuition Free Municipal Schools*	*Students in Private Schools*	*Total*
0	1	2	3	4
1.	Rs. 1–3,600 and below	32	9	41
2.	Rs. 3,600 and above	7	55	62
	TOTAL (1+2)	39	64	103

Our inquiry tells us that the distribution of students according to family income is within each category of schools, i.e., in government as well as private schools. As we reject the distribution of students at the first stage according to family income as revealed in our sample, we might use the information with respect to distribution within each category and combined it with the all-India distribution of students between the two categories of schools. In this manner we are able to get the results given in the following table:

S. No.	*Income Group (Rs. per year)*	*Students in Govt. Schools*	*Students in Private Schools*	*Total*
0	1	2	3	4
1.	Rs. 3,600 and below	62	4	66
2.	Rs. 3,600 and above	13	21	34
	TOTAL (1+2)	75	25	100

Thus, the distribution of students between government and private schools at the elementary stage according to income group for the country as a whole is almost the reverse of that obtained in our survey.

On the basis of the distribution of students for the country, our distribution, then should have been as under:

S. No.	*Income Group (Rs. per year)*	*Students in Govt. Schools*	*Students in Private Schools*	*Total*
0	1	2	3	4
1.	Rs. 3,600 and below	63 (94)	4 (6)	67 (100)
2.	Rs. 3,600 and above	14 (39)	22 (61)	36 (100)
	TOTAL (1+2)	77 (75)	26 (25)	103 (100)

Note: Figures in brackets are percentages of the distribution of students between government and private schools according to income group.

Thus, there should have been 67 students instead of 41 in the lower income group and only 36 students instead of 62 in the higher income group. As a result, the proportion going to government schools and that going to private schools has also changed. It was 38 per cent and 62 per cent in our sample; now it is 75 per cent and 25 per cent respectively. 94 per cent of the students of low income group go to municipal schools as against 39 per cent of high income group.

This chapter is divided into the following sections:

1. Tuition cost.
2. Non-Tuition cost, and
3. Concluding observations.

Composition of the private costs of elementary education:

1. *Tuition Cost*

TABLE 1

NET TUITION, NON-TUITION, AND NET TOTAL COST PER PUPIL ACCORDING TO INCOME GROUP

(*In Rs.*)

S. No.	*Income Group (Rs. per year)*	*Net Tuition Cost per Pupil* (1)	*Non-Tuition Cost per Pupil* (2)	*Net Total Cost per Pupil*
0	1	2	3	4
1.	1–3,600	11·9 (47·0)	13·5 (53·0)	25·4 (100·0)
2.	3,600 and above	54·3 (34·8)	101·7 (85·2)	156·0 (100·0)
	TOTAL (1+2)	26·8 (37·7)	44·3 (62·3)	71·1 (100·0)

Note: Tuition cost is net amount of scholarship received by the students. 22 per cent and 11 per cent (i.e., 2 and 6 students) of the students of low and high income group received aid respectively. Out of six aided students belonging to high income group, four got full freeship, two students were teachers' children and the parents of the remaining two were government employees.

Expenditure on lodging and boarding is not included in Column 1 as only one student out of one hundred and three, has spent Rs. 600 on it.

Figures in brackets denote percentages of net tuition cost and non-tuition cost per pupil to net total cost per pupil.

From Table I it can be seen that there is a wide difference in the net total cost incurred per pupil among the income group of Rs. 1—3,600, and that above Rs. 3,600. To the former it is only Rs. 25·4, whereas to the latter it is Rs. 156·0, six times the former.

In the case of students whose annual family income is Rs. 3,600 and below, both costs, tuition and non-tuition, are more or less of equal significance as they account for 47 per cent and 53 per cent of the total cost respectively. As against this, for students who come from families earning annually more than Rs. 3,600, non-tuition cost accounts for nearly 2/3rd (65 per cent) of the total cost, whereas tuition cost accounts for slightly more than 1/3rd (35 per cent) of the total cost. As a result, we notice a larger difference in the non-tuition cost per pupil rather than in the tuition cost between the students of the low and high income group. Non-tuition cost per pupil of the income group, Rs. 1—3,600, is Rs. 13·5 and of the income group, above Rs. 3,600, it is Rs. 101·7—the latter is more than seven times the former. Similarly, the net tuition cost per pupil is Rs. 11·9 and Rs. 54·3 respectively—the latter is approximately five times the former.

Net tuition cost and non-tuition cost per pupil are Rs. 26·8 and Rs. 49·3 respectively when students of low and high income group are taken together. Net total cost per pupil, then, works out to Rs. 71·1. These two costs account for 38 per cent and 62 per cent of the net total cost respectively.

The composition of the private costs of education for families at various levels of income given above in Table I refers to all students whether going to municipal or private schools. Below, in Table 2, we give the net tuition cost per pupil of private and municipal schools separately.

TABLE 2

Net Tuition Cost per Pupil in Municipal and Private Schools

(In Rs.)

S. No.	*Income Group (Rs. per year)*	*Net Tuition Cost per Pupil*	
		Municipal Schools	*Private Schools*
0	1	2	3
1.	1–3,600	...	54·2
2.	Above 3,600	...	60·1
	TOTAL	..	59·2

From Table 2 it can be seen that the difference in the net tuition cost per pupil between income groups narrows down considerably once we allow for the fact that of the students of the low income group, 94 per cent do not pay fees as they go to municipal schools. As against this, only 39 per cent of the students of the income group above Rs. 3,600, go to municipal schools and enjoy free education. If we take into account the fees paid by 6 per cent of the students of the former income group, net tuition cost per pupil works out to Rs. 54·2 which is very close to Rs. 60·1 obtained for 61 per cent of the students of the income group, above Rs. 3,600, going to non-municipal schools.

For 94 per cent and 39 per cent (75 per cent of the total number of students at this stage in our sample) of the students of low and high income group respectively going to tuition-free municipal schools, the problem of financing tuition fees does not arise. This means, then, that the problem arises only for 6 per cent of low income group students and 61 per cent of high income group students.

Thus broadly, only those who can afford to pay tuition fees, send their children to private schools.

Moreover, apart from the snob value associated with private schools, they are also supposed to be better equipped and better staffed as compared to municipal schools. Students pay fees for better schooling facilities. In this sense, fees cannot be considered as a form of taxation but as price paid voluntarily for the returns, real or imaginary, which private schools offer.

Thus tuition cost does not seem to be burdensome at this stage.

2. *Non-Tuition Costs*

Non-tuition costs included in our study are the following: costs of books and stationery, private tuition, transport and refreshment, and of lodging and boarding.

TABLE 3

NON-TUITION COSTS, TOTAL AND PER PUPIL, ACCORDING TO INCOME GROUP

(*In Rs.*)

S. No.	*Income Group (Rs. per year)*		*Books*	*Stationery*	*Private Tuition*	*Transport and Refreshment*	*Total*
0	1		2	3	4	5	6
1.	1–3,600	T	402·0	368·5	60·3	73·7	904·5
		A	6·0	5·5	0·9	1·1	13·5
		P	44·4	40·8	7·0	7·8	100·0
2.	3,600 and above	T	626·4	316·8	2,239·2	478·8	3,661·2
		A	17·4	8·8	62·2	13·3	101·7
		P	17·1	8·7	61·1	13·1	100·0
	TOTAL (1+2)	T	1,028·4	685·3	2,299·5	552·5	4,565·7
		A	10·0	6·6	22·3	5·4	44·3
		P	22·6	14·6	50·7	12·1	100·0

Note: T–refers to total, A–refers to average and P–refers to percentages.

From the above Table it can be seen that students belonging to low income group largely spend on books and stationery. Expenditure on books and stationery is Rs. 6·0 and Rs. 5·5 respectively. They together account for 85 per cent of the total non-tuition cost. As such, other items of non-tuition cost are of little significance to them.

As against this, we get quite a different picture of the importance of non-tuition costs from the point of view of high income group, i.e., above Rs. 3,600.

The most important item of non-tuition cost is 'Private Tuition.'[5]

It is Rs. 62·2 per pupil—62 times higher than the private tuition cost per pupil of low income group. It accounts for 61 per cent of the total non-tuition cost per pupil. In absolute amount as well as in terms of percentage private tuition cost is more than the net tuition cost. The former is Rs. 62·2, whereas, the latter is Rs. 54·3. These costs account for 39·8 per cent and 34·8 per cent of the total private cost per pupil of high income group respectively.

The difference in the non-total cost per pupil of low income group and that of high income group reduce to nearly one-half (i.e., to 3·5 times from six times) once we allow for such a high expenditure on private tuition.

Next, in order of importance, comes the expenditure on books. It is Rs. 17·4 per pupil, three times the expenditure on books incurred by the students of the low income group. It is followed by the expenditure on refreshment and transport, and on stationery. Per pupil expenditure on the above two items of non-tuition costs—refreshment and transport, and stationery is Rs. 13·3 and Rs. 8·8 respectively—13 and 0·5 times the similar costs to the students of low income group.

Even when students of two income groups are taken together, the private tuition cost is the most outstanding of all. It is Rs. 22·3 per pupil. It forms 51 per cent of the non-tuition cost and 35 per cent of the net total cost (tuition+non-tuition).

Other non-tuition costs, in order of importance, are books, stationery, and refreshment and transport. Per pupil expenditure on these non-tuition items is Rs. 9·9, Rs. 6·3, and Rs. 5·3 respectively.

From the above analysis of the non-tuition costs, it can be easily observed that the students of high income group relatively spend more on each of the above mentioned items of non-tuition expenditure.

No less interesting is the non-tuition cost per pupil going to municipal as well as private schools. This is given in Table 4.

From the Table it can be seen that students going to private elementary schools, whether belonging to low or high income group, spend more on non-tuition items as compared to the expenditure incurred on these items by the students going to municipal schools. To the former, it is Rs. 24·1 and Rs. 109·4 per pupil of low and high income group respectively, whereas to the latter, it is Rs. 10·6 and Rs. 13·2 per pupil of low and high income group respectively. But the difference in the non-tuition cost per pupil of low and high income group going to municipal schools is not that large as it is observed in the case of students of private schools.

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[5] *See* Chapter III, 'Teacher Status', in the *Report of the Education Commission*, 1964–66, Govt. of India. 'At the school stage the chief source of additional earnings to teachers is private tuitions. This practice prevails largely in urban areas and in many places, complaints are made that it has become almost a scandal'.

TABLE 4

NON-TUITION COST PER PUPIL IN MUNICIPAL SCHOOLS AND PRIVATE SCHOOLS

(*In Rs.*)

		Municipal Schools					*Private Schools*				
S. No.	*Income Group (Rs. per year)*	*Books*	*Stationery*	*Private Tuition*	*Transport and Refreshment*	*Total*	*Books*	*Stationery*	*Private Tuition*	*Transport and Refreshment*	*Total*
0	1	2	3	4	5	6	7	8	9	10	11
1.	1–3,600	5·3	4·6	...	0·7	10·6	8·8	8·7	4·0	2·6	24·1
2.	Above 3,600	8·0	5·2	...	...	13·2	18·2	9·1	67·6	14·5	109·4
	TOTAL (1+2)	5·8	4·7	...	0·6	11·1	16·7	9·9	57·8	12·7	96·3

Students going to municipal schools mostly spend on books and stationery; similarly, the expenditure on books and stationery accounts for quite a large proportion of the non-tuition cost to students of low income group going to private schools. Even then, the expenditure on books and stationery (only in the case of children going to municipal schools is far below than that incurred by the private school going children of high income group. Only private school students spend on private tuition.

What can be observed from this analysis of the non-tuition cost structure of students of two types of schools and also of different income groups ?

Unlike tuition fees (where education is not free), non-tuition educational expenses are voluntary in nature in the sense that students or their parents can spend as much as they can afford. If so, the non-tuition costs to students of high income group cannot be considered as burdensome. On the contrary this gives one an idea of their ability to pay for education. The high amount of expenditure incurred on private tuition indicates that rich students pay for extra teaching outside schools. This means that they make larger use of one of the important inputs entering education industry, namely teachers (if they go to private coaching classes, not run by teachers, they make use of the scarce factor, namely, educated people). Not only that the quality of teaching imparted to them is somewhat better than that imparted to poor students of municipal schools, but also they further improve upon the quality by paying for extra teaching.

What does this imply ? Can this difference in the non-tuition cost per pupil of two types of schools be taken as indicating the difference in the educational standards in two categories of elementary schools ? Is it going to have a bearing on the educational attainments of students of different income groups later on at higher levels of education ? Is it going to widen the educational distance, and consequently, economic distance, between them ?

The answer seems to be in the positive if the observed difference in the non-tuition costs be taken as reflecting on educational standards of students.

Now, we come to the second important observation made by the Education Commission regarding the cost of books and stationery.

We make a comparison of the cost of books and stationery given by the Commission[6] with that of our inquiry. This is given in Table 5.

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[6] See *Op. Cit., Report of the Education Commission*, Table 6.3 'Private Costs of Education (Annual) 1965–66', p. 133, Chap. VI.

TABLE 5

Cost of Books and Stationery

(*In Rs.*)

		Education Commission's Estimates				*Our Estimates*							
						Rs. 1–3,600				*Above Rs. 3,600*			
S. No.	*Class*	*Lowest*		*Highest*		*Lowest*		*Highest*		*Lowest*		*Highest*	
		Books	*Stationery*	*Books*	*Stationery*	*Books*	*Stationery*	*Books*	*Stationery*	*Books*	*Stationery*	*Books*	*Stationery*
0	1	2	3	4	5	6	7	8	9	10	11	12	13
1.	I	0·50	0·60	17·80	12·80	0·75	0·50	5·00	3·00	4·00	2·00	50·00	15·00
2.	II	0·54	0·60	16·60	12·80	2·50	1·00	5·00	5·00	2·50	2·50	5·00	5·00
3.	III	0·69	2·11	28·51	8·33	2·00	2·00	20·00	25·00	5·00	3·00	30·00	15·00
4.	IV	2·10	3·26	38·85	14·50	2·00	2·00	10·00	5·00	12·00	8·00	30·00	20·00
5.	V	3·91	2·40	36·10	14·50	6·00	3·00	10·00	10·00	5·00	5·00	40·00	20·00
6.	VI	5·85	4·63	43·24	60·00	2·00	2·00	20·00	25·00	7·00	3·00	50·00	25·00
7.	VII	0·29	4·88	47·09	75·00	2·00	2·00	10·00	10·00	15·00	5·00	30·00	15·00
8.	VIII	9·30	6·95	169·66	21·40	10·00	5·00	15·00	10·00	20·00	8·00	50·00	20·00
	TOTAL	29·88	25·43	397·87	219·33	27·25	17·50	95·00	93·00	70·50	36·50	285·00	135·00
	Average	3·74	3·18	49·73	27·42	3·40	2·19	11·88	11·63	8·81	4·56	35·62	16·88

From the Table it can be seen that the Commission has given two types of estimates—the highest and the lowest—of the cost of books and stationery for each class at the elementary stage of education.

Instead of taking these expenditures on books and stationery respectively for each class of elementary education, we have calculated the average annual expenditure on books and stationery first by summing up these costs and then dividing the total by the number of classes (I-VIII) which is equivalent to the duration of eight years of elementary education.

On the basis of this exercise, the lowest estimates of expenditure on books and stationery work out to Rs. 3·74 and Rs. 3·18 respectively. These are fairly close to our lowest expenditure with respect to the students of the income group, Rs. 1—3,600. It is Rs. 3·40 and Rs. 2·19 respectively. Expenditure on books and stationery, then, amounts to Rs. 6 to Rs. 7. The lowest expenditure, from the point of view of students of the income group, above Rs. 3,600, is Rs. 8·81 and Rs. 4·56 on books and stationery respectively.

The highest estimates of the expenditure on books and stationery given by the Commission are Rs. 49·73 and Rs. 27·42 respectively. The total of these two is Rs. 77·15.

In our case, the highest expenditure with regard to the students of the high income group, is Rs. 35·12 and Rs. 16·88 on books and stationery respectively. The total comes to Rs. 52·50. We notice a difference of nearly Rs. 25 between the two highest estimates given above. The highest expenditure in our study, with respect to the students of the low income group, is Rs. 11·88 on books and Rs. 11·63 on stationery. Combined expenditure comes to Rs. 22·51—which is far below the similar cost obtained earlier.

The comparison shows that the difference in the two estimates given by the Commission is quite large as compared to that in our study. The highest combined expenditure on books and stationery is eleven times, the lowest. As against this, in our case, it is only four times the lowest, both from the point of view of students of low as well as high income group.

However, the disparity noticed above in the Commission's estimates and our estimates narrows down considerably, once we work out the difference in the combined lowest and highest expenditure by taking into account the lowest expenditure on books and stationery by the students of low income group and the highest by the students of high income group in our inquiry. The highest expenditure on books and stationery, then, is nine times the lowest. In this way, we can say that the lowest estimates in the case of the Education Commission refer to the expenditure incurred on books and stationery by poor students and the highest estimates refer to rich students.

On the basis of these estimates, the Commission concludes that, " parents are required to incur very heavy expenditure for this purpose, and consequently only a small proportion of children have all the books at the beginning of the school year; a much larger proportion have them only towards the middle or even the end of the school year. Not infrequently a proportion of students have no books at all. This has a very adverse effect on standard. "[7]

It can be argued that for the purpose of arriving at the above conclusion the Commission would have worked out the reasonable amount to be incurred on these two non-tuition items sufficient enough to maintain standards, as the high amount of expenditure on these two by rich students, by no means, can be considered as the best index.

Here, we take into account the average annual expenditure on books and stationery. As observed previously, combined expenditure is Rs. 11·5 per pupil of low income group; Rs. 26·2 per pupil of high income group, and Rs. 16·2 per pupil of both low and high income group taken together.

On the basis of these averages, we can say that elementary school students are required to spend somewhere between Rs. 12 to Rs. 16 annually on books and stationery.[8]

All twenty-six students of private schools, whether belonging to low or high income group, have been spending more than Rs. 16.

Of the remaining 77 students going to tuition free municipal schools, 27 (or 35 per cent) have been spending Rs. 12 and above, whereas 50 students (or 65 per cent) have been spending less than this amount. Most of them have been spending less than Rs. 10 annually on books and stationery.[9]

This amounts to saying that poor students going to municipal schools do not spend sufficiently on books and stationery at this stage.

Thus, the Commission's observation stands and is justified in its recommendation that, 'a programme should immediately be developed for providing at least textbooks, if not stationery also, free of charge (or at concessional rates) to all students (or at least to all the needy and deserving students)'.[10]

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[7] See *Op. Cit.*, *Report of the Education Commission*, Chap. VI, p. 113.

[8] *See* V. N. Kothari, 'Factor Cost of Education in India', published in April–June 1966 issue of the quarterly, *The Indian Economic Journal*. He has assumed that at the elementary stage a pupil is required to spend Rs. 12 per year on books, stationery and equipment.

[9] While calculating these proportions, we have taken into consideration the book aid received by the students. The proportion of students of two types of schools covered by book aid is 13·5 per cent and 7·6 per cent respectively. It has covered 19·5 per cent and 3·2 per cent of students of low and high income group respectively.

[10] See *Op. Cit.*, *The Education Commission Report*, Chap. VI.

When viewed in this way, it appears that the private schools are certainly better than the municipal schools, and unless poor students of municipal schools are adequately covered by aid programmes, the composition of students at the higher levels of education is likely to be adversely affected.

As poor students have to economize on certain essential educational expenses, and as they go to sub-standard municipal schools, the rate of repetition or failure is bound to be higher than that in the case of rich students.

TABLE 6

STAGNATION AT THE ELEMENTARY STAGE OF EDUCATION (ACCORDING TO INCOME GROUP)

S. No.	*Income Group (Rs. per year)*	*Rate of stagnation (in percentages)*
0	1	2
1.	1–3,600	59·1
2.	Above 3,600	31·9
	TOTAL	40·7

From Table 6 it can be seen that 59·1 per cent of the poor students of the age-group, 6-14, are not found in the corresponding grade or class of elementary education. This rate is nearly twice the rate obtained for rich students studying at this stage. As a result, most of the poor students fail to complete the eight years of compulsory elementary education in time and ultimately premature withdrawal from schools takes place.

Frustration arising from the high rate of failure can also be considered as the contributory factor to the premature withdrawal of students from schools.

3. *Concluding Observations*

1. As most of the students of limited means take advantage of the provision of free elementary education, the problem of financing tuition fees does not arise at this stage.

2. Rich students mostly go to private schools and pay tuition fees as well as spend lavishly on items other than tuition fees. They pay more for the better educational facilities.

3. Insignificant expenditure on lodging and boarding as well as on transport by students at this stage, indicates that students stay with their parents and so these costs do not restrict access to elementary education.

4. The cost of books and stationery is of very great importance to poor students. Annual expenditure on books and stationery incurred by the students of low income group is not only far below that incurred by the students of high income group, but also it is less than the average annual amount of Rs. 12 or Rs. 16. This will, certainly, have an adverse effect on standards.

5. Disparity in educational standards exists not only between students of low and high economic status but also between two types of schools—tuition free municipal schools and private schools.

This disparity, together with poor financial position of students' parents, appears to be responsible for the early withdrawal of students. As a result, the educational distance between the two gets widened.

Thus, to reduce the extent of disparity and consequently the distance between the two, on the one hand, the burden of the non-tuition costs should be reduced and on the other hand, the quality of teaching in municipal schools should be improved.

Chapter Seven

Expenditure on Professional School Education in India, 1950-51 to 1960-61

K. R. SHAH*

In this chapter we examine the trend in expenditure incurred on professional schools at the second level. They include vocational and technical schools, teacher training schools and exclude schools for special education[1].

Expenditure on technical and teacher training schools can be regarded as a purely *Investment Expenditure*, because the element of consumption (which can be said to exist when education is taken or imparted for the sake of education) is absent in this type of education. It is directly productive. The same holds for teacher training schools but not for special schools. The special schools are a class by themselves, and though professional in a sense, they impart instruction of a type, be it in music or fine arts, be it intended for adults or for handicapped children of one description or another, its content is mostly of the general or liberal variety.

Technical and teacher training schools assist the growth process by meeting the requirements for the type or types of technically trained personnel of a developing economy. They fulfil the demand of two sectors—Industrial Sector and Education Sector—for trained personnel —workers and teachers.

Their expansion has to be planned in line with the expanding demand of a developing economy. More and more persons with special training will be demanded. So, more such schools are to be opened to cope with the demand.

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*Author is highly thankful to Prof. I. S. Gulati, Head, Department of Economics. University of Baroda, for his guidance in writing this chapter.

[1] i. Vocational and technical schools cover the following categories of vocational education:
(*a*) Agriculture, (*b*) Arts and Crafts, (*c*) Commerce, (*d*) Engineering, (*e*) Forestry, (*f*) Industry, (*g*) Medicine, (*h*) Physical education, (*i*) Techno-logy-Polytechnic, (*j*) veterinary and (*k*) others.

ii. Teacher training schools include both types of training schools–basic and non-basic.

iii. Special education schools include schools for (*a*) music, dance, (*b*) other fine arts, (*c*) oriental studies, (*d*) social workers, (*e*) social (adult) education, (*f*) reformatory and (*g*) handicapped persons. In terms of enrolment, social (adult) education schools account for about 90 per cent of the total enrolment in special schools.

This makes it necessary that the system of education should shift its emphasis from general or liberal education to technical education, imparting special training in various skills.

With the accent on industrialization in the Indian plans, the demand for skilled personnel is bound to increase at a fast rate. It is naturally of great interest to study how the system of education in India is being readjusted to meet the above demand. This is equally applicable to professional higher education.

A study of the trends in expenditure and connected variables should help us in answering this question.

Trend in Expenditure

Over the period under review, 1950–51 to 1960–61, the total direct expenditure on professional schools increased from Rs. 36·9 million in 1950–51 to Rs. 114·1 million in 1960–61, indicating a decennial rate of growth of 209·2 per cent. This growth rate is slightly higher compared to the growth rate of 191·3 per cent recorded for the non-professional schools (*See* Table 1)[2]. Still, we spent nearly 6 times more in 1950–51 on general education at the secondary stage than on professional schools. In 1960–61, expenditure incurred on general education was lower at approximately five times the expenditure incurred on professional schools.

The increase in expenditure referred to above is in current prices. In Table 2, the increase in total direct expenditure incurred on professional schools of the second level has been calculated in terms of constant indices[3]. The increase in direct expenditure, in terms of constant salary-per-teacher and constant wholesale prices, works out to 131·4 per cent over the period. In terms of constant prices, salary expenditure in professional schools went up by 64·6 per cent and non-salary expenditure by 207·8 per cent.

The increase in expenditure on professional schools in real terms is lower than the corresponding increase of 143·3 per cent in direct expenditure on general education at the secondary stage.[4]

The growth rates of expenditure obtained above clearly indicate that the professional schools are not expanding as fast as the non-professional schools. But this is bound to create an impression that the expansion of education at the secondary stage is not taking place in a manner consistent with the manpower requirements of development. Such an impression is not wholly warranted.

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[2] All Tables are grouped together in *Appendix B.*

[3] Indices used in expressing the growth of expenditure on professional schools education in real prices is given in Appendix A.

[4] Comparison of the performance of professional schools with that of general education schools in this paper is based on the chapter on 'Expenditure on General Education Schools' of my *Ph.D. Thesis* on *Outlay on Education and Its Financing in India*--1950–51 *to* 1960–61 in progress.

Taking technical schools by themselves, the rate of growth of expenditure in terms of constant salary-per-teacher combined with constant wholesale prices works out to 146·5 per cent which is higher than the rate obtained for general education. For teachers' training schools the rate of growth is 112·5 per cent.

Public Expenditure and its Allocation

Of the total direct expenditure incurred on professional schools in 1950–51, 77·5 per cent was met out of government funds. This proportion went up to 80 per cent in 1960–61 giving a rise of 219·2 per cent in the absolute outlay of the government funds. This is even higher than the growth rate of 209·2 per cent obtained for total direct expenditure. Still this growth rate is low compared to that of 300·0 per cent obtained for the non-professional schools. But the proportion of public expenditure to total direct expenditure with respect to professional schools was higher at 80 per cent in 1960-61 compared to the proportion of 53 per cent obtained for the non-professional secondary schools.

Of the total public expenditure incurred on the second level as a whole (including both professional and non-professional schools) of Rs. 119·2 million in 1950–51, Rs. 90·6 million (or 76 per cent) was spent on non-professional schools. Of the total public expenditure of Rs. 454·4 million in 1960–61, the non-professional schools accounted for Rs. 363·1 million (or 80 per cent). This shows that the government bodies spent in 1960–61 nearly four times as much on non-professional schools as that on professional schools. Public expenditure on professional schools was Rs. 91·3 million in 1960–61 (*See* Table 3).

Allowing for the fact that some non-professional schools have technical departments and impart technical education, still the public expenditure on non-professional schools is very much larger than on professional schools.

Trend in Enrolment and Per Pupil Expenditure

From Table 4-A, it can be observed that the total enrolment at the second level of education (*i.e.*, professional and non-professional schools) increased from 1·4 million in 1950–51 to 3·5 million in 1960–61—a growth of 72·2 per cent. The growth rate of enrolment was of the order of 114·2 per cent in professional schools. In non-professional schools of this level the corresponding growth rate over the decade of 1950's was 146·1 per cent. The growth rate of expenditure incurred on technical and teachers' training schools on the one hand and non-professional schools on the other, was 209·2 per cent and 191·3 per cent respectively. Thus the growth rate of expenditure in current prices in both types of schools, professional and non-professional, exceeds the growth rate of enrolment. It terms of constant prices, however, the increase in expenditure is higher than that of enrolment only with respect to professional schools. The growth rate of real expenditure for professional schools was 131·4 per cent whereas for general education schools at the secondary stage it was 143·3 per cent.

This gives a rise of 8·2 per cent in per-pupil expenditure in real terms in professional schools (Col. 7 Table 4-B) as against the decline of 1·2 per cent in per-pupil real expenditure in non-professional schools. Expenditure per pupil of professional schools of Rs. 284·4 (in current prices) in 1960–61 *was more than one-half* the expenditure per pupil of general education schools in 1960–61.

Of even greater interest is the distribution of pupils at the second level of education. The total enrolment in non-professional schools in 1950–51 was nearly 7·5 times higher than in professional schools. In 1960–61 the gap was even wider. The former was nearly 8·5 times the latter.

Teacher-Pupil Ratio

It can be seen from Table 5 that the teacher-pupil ratio of 1 : 11 in professional schools in 1950–51 declined to 1 : 15 in 1960–61—a fall in ratio of 29 per cent. This means that there were more students per teacher in professional schools in 1960–61 than in 1950–51. As against this, the ratio declined by only 2·2 per cent in non-professional schools. The ratio at the secondary stage of non-professional school was lower (at 1 : 18 in 1960–61). This fall in ratio is due mainly to the decline of 55 per cent in teacher-pupil ratio in vocational and technical schools. But the ratio has actually increased (*i.e.*, there are fewer students per teacher) with respect to teachers' training schools.

This naturally leads one to feel that a deterioration in the standard of professional education in India might have taken place in the decade of 1950's.

In terms of absolute number of students per teacher, it can be observed that despite the steeper fall in teacher-pupil ratio in professional schools, there were in 1960–61 still fewer students in professional schools (15 per teacher) compared to the students per teacher in non-professional schools at the secondary stage (18 per teacher). This indicates that the ratio is still high in professional schools. In fact, it could be argued that the decline in teacher-pupil ratio should be viewed with satisfaction because this reflects fuller utilization of schooling facilities available in professional schools. As we shall observe in the following section there is a great deal of substance in this argument because it appears on the basis of an international comparison of teacher-pupil ratio that the Indian ratio is possibly much above the optimum ratio and therefore indicates under-utilization of capacity.

Level of Expenditure

For appraising the state of professional education (School level) in India, we resort to the technique of making comparisons of the trends in expenditure and other related variables in professional schools in India with those of similar schools of both the developed and the under developed countries. In this section we attempt, wherever possible, international comparisons to obtain an idea of the extent of leeway to be made up and the directions in which it has to be made up. From the outset, it seems advisable to make ourselves aware of the limitations of international comparisons. These comparisons give one an idea of the 'state' of education in one country compared to that of in other countries. To have a comparative picture of the 'state' of education, one has to determine the indices on the basis of which the 'state' of education can best be adjudged, within the limitations of available information. Viewed in this manner, the first and the foremost index of the 'state' of education should be the proportion of school-age children actually attending schools and colleges. But this is a quantitative index only. Between two countries with the same proportion of school-age children attending schools, there could be a large disparity in the 'state' of education depending upon the quality of the instruction and training imparted. When it comes to appraising the quality of education, one is naturally on somewhat uncertain grounds. How does one directly measure the quality of education?

For our purposes, we have decided to rely on rather a crude measure to adjudge the quality of education, namely the teacher-pupil ratio and the expenditure per pupil. International comparisons are meaningful, but upto a point only. Stretched beyond this point, they can be quite misleading. In making these comparisons, we are quite aware of these limitations.

Teacher-Pupil Ratio

As observed earlier, the number of students per teacher in India increased by 29 per cent and still the number of students per teacher in 1960–61 was 15 as against 22 in Japan and Canada and 27 in West Germany. On the other hand, in several under-developed countries such as Iraq, Indonesia and U.A.R., the number was much lower at 15, 14·0, and 13 respectively (*see* Table 6).

This gives one strong reason to suspect that ratios are rather high in under-developed countries, including India, and that most probably quality in professional schools would not suffer if the teacher-pupil ratio is allowed to decline somewhat. Of course, this raises the question of complementary non-salary expenditure (current and capital) and it might well be that under-utilization of teacher capacity might be caused by the short-fall in non-salary expenditure.

Actually, however, as observed above, the rate of growth in real terms in non-salary expenditure during the last decade has been more than thrice as fast as in salary expenditure. This being the case, it does appear to us that under-utilization of capacity exists in Indian professional schools at the school level. This brings to our attention the possibility of enrolling pupils in still larger number without at the same time increasing the supply of teachers.

Enrolment in Professional and Non-Professional Schools

Against the total enrolment at the secondary stage in India in non-professional schools of 3·1 million in 1960-61, enrolment in professional schools was only 0·4 million. Thus only 9·4 per cent of the students enrolled at the secondary stage were studying in professional schools. This proportion is lowest compared not only to that of the developed countries but also to that of the under-developed countries (See Table 7).

This may be taken to show that the re-adjustment in the system of secondary education in India has been taking place very slowly and taking a long time.

A shift in bias in secondary education from liberal to technical subjects is necessary not only from the narrow point of view of meeting the increasing demand for technically trained hands but also from the much broader point of view of creating within the country a climate conducive to technological advance. What a difference it would make to the whole economic climate of the country, if at some stage in India too as in West Germany for every 10 students taking secondary school courses in liberal subjects there are 11 taking technical courses.

Expenditure on Professional and Non-professional Schools

The impression that enough is not being done in India towards a re-adjustment of educational bias at the secondary stage gets further confirmation from Table 8. The proportion of total expenditure on secondary education, in India going to technical schools is 11·7 per cent. In Iraq and the Philippines, the corresponding percentages are 20·4 and 48·0 respectively. In Sweden, France and Germany, the comparable percentages are 29·0, 38·4 and 39·1 respectively.

What is the remedy to the existing situation? If we assume that the additional funds available for the expansion of facilities at the secondary stage as a whole are fixed over, say the next period, expansion of the technical side can take place only at the expense of the general education. This would mean a drop[5] in enrolment in non-professional schools unless the teacher-pupil ratio in these schools is allowed to decline. But, as we have observed, on the basis of international comparison, there appears to be scope for raising the number of students per teacher at the secondary stage both in the professional as well as non-professional schools. However, the scope appears to be greater in professional schools for raising the number of students per teacher.[6]

Conclusion

The allocation of total direct expenditure incurred on the second level of education between professional and non-professional schools and the distribution of pupils between the two show that the re-adjustment in the system of education, *i.e.*, shift in emphasis from general to technical education, has been taking place rather slowly in India.

International comparisons, on the basis of the two above referred variables, also lead us to the similar conclusion.

This is equivalent to saying that the professional education needs to be developed rapidly. And there is tremendous scope for its rapid growth from the point of view of (i) of under-utilization of teacher capacity, and (ii) performance, of professional school education calculated in terms of the increase in total direct expenditure and that of per pupil in real prices.

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[5] Per pupil direct expenditure in technical schools was roughly 50 per cent higher than that in general education schools in the year 1960–61. On this basis, for every 2 students additionally admitted to technical schools, 3 students will be sent back from the general education schools. How costly the expansion of technical and vocational school education in India is, can also be seen from the per pupil expenditure of technical school and that of arts and science colleges. In 1960–61, the former was Rs. 272·7 whereas the latter was Rs. 302·4. In other words, this means that the expansion of technical school education is as costly as the expansion of general higher education.

[6] At the 1960–61 level of teacher-pupil ratios, the number in technical schools could be raised by 15 per cent if the ratio in technical schools is reduced to that in the general education schools. The number can be increased by 70 per cent if the ratio is allowed to decline to the level obtaining in Germany.

APPENDIX A

The available data on the progress of expenditure are in terms of current prices. But when we want to appraise the progress in real terms the problem of adjusting the available data creates difficulties.

It could be argued that if the purpose is to arrive at some measure of the real increase in expenditure on education, correction of current price figures should not be made in terms of wholesale price changes or even cost of living changes. After all, these indices do not correctly reflect the weightages of various items of expenditure entering education. In this context the observation made in the *Robbins Report on Higher Education* is relevant: 'There is no accurate method of expressing the expenditure on higher education in terms of constant prices, because no price indices are available which properly correspond to the individual components of this expenditure '.

This naturally raises the question: Which are the important items of education? The expenditure on teachers' salaries is the most outstanding item of direct expenditure. For all levels and types in India, teachers' salaries accounted for 72% of total direct expenditure and 54% of total expenditure (direct plus indirect) in 1960–61.

So, any variation in the salary per teacher is certainly much more significant than price changes in items like food, clothing, fuels, etc., which figure importantly in cost of living and wholesale price indices. On the basis of the trend in average annual salary per teacher, we can construct the *salary-index* and express the growth of expenditure in terms of that index.

There is still one snag in our reasoning so far. In adopting the salary-per-teacher index, we are applying the correction to the entire expenditure on education, whereas strictly speaking, it applies only to that part of the expenditure which is incurred on teachers' salaries. Non-salary expenditure should, ideally speaking, be corrected in terms of price change relevant to those non-salary items on which expenditure is incurred. But sufficient information is not available to construct a satisfactory index of prices for this purpose. We have, therefore, chosen to correct non-salary direct expenditure in terms of constant wholesale prices.

Under indirect expenditure, we considered it more appropriate to correct salary expenditure in terms of constant salary, scholarships in terms of constant cost of living, building in terms of constant cost of building and miscellaneous in terms of constant wholesale prices. ' Salary expenditure ' covers expenditure on direction and inspection and on ' hostel charges '. Expenditure on ' hostel charges ' is mainly a maintenance expenditure.

APPENDIX B

TABLE 1

PROGRESS OF DIRECT EXPENDITURE ON PROFESSIONAL SCHOOLS IN CURRENT AND CONSTANT PRICES, 1951–60

(Rs. in million)

Year	*Total Direct Expenditure in Current Prices* 1	*Salary Expenditure in Current Prices* 2	*Non-Salary Expenditure in Current Prices* 3	*Salary Expenditure in Constant Salary per Teacher* 4	*Non-Salary Expenditure in Constant Wholesale Prices* 5	*Total Direct Expenditure in 'Combined Index'* (4+5) 6
1950–51	36·9	19·8	17·1	19·8	17·1	36·9
1951–52	39·6	21·0	18·6	20·9	18·7	39·6
1952–53	40·1	20·7	19·4	20·9	21·5	42·4
1953–54	40·5	21·7	18·8	22·1	20·8	42·9
1954–55	46·0	24·2	21·8	24·4	25·2	49·6
1955–56	54·6	26·0	28·6	28·4	34·6	63·0
1956–57	58·0	30·4	27·6	29·3	29·3	58·6
1957–58	72·2	35·3	36·9	31·4	38·1	69·5
1958–59	82·1	40·3	37·8	34·3	37·4	71·1
1959–60	92·9	45·6	47·3	37·5	45·2	82·7
1960–61	114·1	55·4	58·7	32·8	52·6	85·4
Decennial Growth Rate	209·2%	179·8%	243·3%	64·6%	207·8%	131·4%

Col. 1: Based on the Report on 'Education in India', Vol. I, *Ministry of Education*, Govt. of India.

Cols. 2 & 3: Arrived at by dividing Col. 1 into 'salary' and 'non-salary' expenditure respectively.

Col. 4: Col. 2 is expressed in terms of 'salary-index' (See Col. 4, Table 2).

Col. 5: Col. 3 is expressed in terms of contant wholesale prices (See Table 3, Col. 3)

Col. 6: Col. 4 + Col. 5.

TABLE 2

SALARY-INDEX OF PROFESSIONAL SCHOOL TEACHERS

Year	*Total Number of Teachers*	*Salary Expenditure (Rs. in million)*	*Average Annual Salary per Teacher (in Rs.)*	*Index Number of Teacher's Salary (1950–51 = 100)*
	1	2	3	4
1950–51	16,396	19·8	1207·5	100·0
1951–52	17,222	21·0	1213·6	100·5
1952–53	18,226	20·7	1135·7	94·5
1953–54	18,314	21·7	1184·8	98·1
1954–55	20,259	24·2	1194·5	98·9
1955–56	22,970	26·0	1131·9	93·7
1956–57	24,218	30·4	1255·3	103·9
1957–58	25,706	35·3	1373·2	113·7
1958–59	28,367	40·3	1420·7	117·4
1959–60	30,071	45·6	1467·6	121·5
1960–61	27,152	55·4	2040·4	168·9
Decennial Growth Rate	65·6%	179·8%	68·9%	68·9%

TABLE 3

PUBLIC EXPENDITURE AND ITS ALLOCATION

(Professional and Non-Professional Schools)

Year	*Total Public Expenditure on Professional and non-professional schools*	*Public Expenditure on Professional schools**	*Public Expenditure on non-professional schools†*	*Percentage of expenditure on Professional schools to total public expenditure*	*Percentage of expenditure on Non-professional schools to total public expenditure*
	1	2	3	4	5
1950–51	119·2	28·6	90·6	24·0	76·0
1951–52	134·3	30·5	103·8	22·7	77·3
1952–53	142·3	30·0	112·3	21·1	78·9
1953–54	153·9	29·3	124·6	19·1	80·9
1954–55	174·3	33·8	140·5	19·4	80·6
1955–56	206·8	40·9	165·9	19·8	80·2
1956–57	235·3	43·6	191·7	18·6	81·4
1957–58	280·3	54·9	225·4	19·6	80·4
1958–59	324·8	63·8	261·0	19·6	80·4
1959–60	387·4	72·2	315·2	18·4	81·4
1960–61	454·4	91·3	363·1	20·0	80·0
Decennial Growth Rate	286·2%	219·2%	300·0%		

Col. 1: is the sum total of Cols. 2 and 3.

Col. 2: shows the expenditure incurred on professional schools education met out of Government-funds.

Col. 3: shows the expenditure on secondary general education schools (inclusive of expenditure on elementary departments of high schools) met out of Government-funds.

Cols. 4 and 5: proportion of total public expenditure incurred on professional and non-professional secondary schools of the second level respectively.

*Proportion of public expenditure to total direct expenditure on professional school education accounted for 77·5 per cent and 80 per cent respectively in 1950-51 and 1960-61.

†Proportion of public expenditure to total direct expenditure on general education schools was 39% in 1950-51 and 53% in 1960-61.

TABLE 4

	A ENROLMENT AT THE SECONDARY STAGE (Professional and Non-Professional Schools)				B EXPENDITURE PER PUPIL IN PROFESSIONAL SCHOOLS		
Year	*Total Enrolment at the Secondary stage (2+5)*	*Number of pupils in Non-Professional Schools*	*Number of pupils in Vocational Schools*	*Number of pupils in Teacher Training Schools*	*Number of pupils in Professional Schools (3+4)*	*Expenditure per Pupil in Professional Schools in Current Prices (in Rs.)*	*Expenditure per Pupil in Constant Prices (in Rs.)*
	1	2	3	4	5	6	7
1950-51	1,439,170	12,51,778	1,17,778	69,416	1,87,194	196·6	196·6
1951-52	1,668,269	14,82,319	1,20,710	65,240	1,85,950	212·8	212·8
1952-53	1,821,628	16,14,519	1,36,078	71,031	2,07,109	200·5	201·9
1953-54	1,929,433	17,21,837	1,34,161	73,435	2,07,506	202·5	204·3
1954-55	2,051,359	18,17,046	1,57,607	76,706	2,34,313	230·0	216·0
1955-56	2,248,708	19,86,243	1,78,998	83,467	2,62,405	182·0	242·3
1956-57	2,424,375	21,52,731	1,88,426	83,218	2,71,644	193·3	217·0
1957-58	2,601,496	23,11,798	2,12.456	77,242	2,89,698	240·7	239·6
1958-59	2,840,886	25,15,224	2,41,463	84,199	3,25,662	249·0	217·3
1959-60	3,049,813	26,88,023	2,72,814	88,976	3,61,790	258·1	230·0
1960-61	3,482,408	30,81,134	2,90,772	1,10,502	4,01,274	284·4	212·8
Decennial Growth Rate	72·2%	146·1%	146·8%	59·1%	114·2%	44·6%	8·2%

Col. 1: is the sum total of Cols. 2 and 5.

Col. 2: refers to the pupils of secondary stage only, *i.e.*, does not include the number of pupils of and elementary departments of high schools.

Cols. 3 and 4: Based on the Report on *Education in India*—Vol. I, Ministry of Education, Govt. of India.

Col 5: Col. 3+Col. 4.

Col. 6: Arrived at by dividing the number of students (Col. 5) by the total direct expenditure on professional schools (Col. 1—Table 1) in current prices.

Col. 7: Obtained by dividing, *Col. 5* by *Col. 6 of Table 1.*

TABLE 5

TEACHER-PUPIL RATIO IN PROFESSIONAL SCHOOLS

Year	*Enrolment (Professional Schools)*	*Number of Teachers*	*Teacher-Pupil Ratio* (1+2)
	1	2	3
1950–51	1,87,194	16,396	1 : 11·4
1951–52	1,85,950	17,222	1 : 10·8
1952–53	2,07,109	18,226	1 : 11·4
1953–54	2,07,596	18,314	1 : 11·3
1954–55	2,34,313	20,259	1 : 11·6
1955–56	2,62,465	22,970	1 : 11·4
1956–57	2,71,644	24,218	1 : 11·2
1957–58	2,89,698	25,706	1 : 11·3
1958–59	3,25,662	28,367	1 : 11·5
1959–60	3,61,790	31,071	1 : 11·6
1960–61	4,01,274	27,152	1 : 14·7
Decennial Growth Rate	114·2%	65·5%	29%

TABLE 6

TEACHER-PUPIL RATIO IN PROFESSIONAL SCHOOLS OF THE DEVELOPED AND UNDER-DEVELOPED COUNTRIES

Name of the Country and the Year of Statistics	*Teacher*	*Pupils*	*Teacher-Pupil Ratio*
1	2	3	4
I. Developed Countries			
a. Federal Republic of Germany (Vocational Schools) (1962)	68,833	18,65,815	1 : 27
b. Canada (1957-58) (Vocational Schools)	5,100	1,13,205	1 : 22·2
c. Japan (1962)	3,98,030	7,41,466	1 : 22
d. France (1962-63)	14,742	2,56,500	1 : 17·4
II. Under-developed Countries			
a. India (1960-61)	27,152	4,01,274	1 : 14·7
Vocational Schools	18,571	2,90,772	1 : 15
b. Iraq (1961-62)	997	14,596	1 : 14·6
Vocational Schools	639	7,369	1 : 11·5
c. Indonesia (1957-58)	20,925	2,93,686	1 : 14·0
d. U.A.R. (1957-58)	7,160	90,625	1 : 12·7
Vocational Schools (1957-58)	6,729	86,701	1 : 12·7

SOURCE: (Developed countries), (*b*) *World Survey of Education*, Secondary Education-III, *UNESCO*.

a, c & d: *International Year Book of Education*, Vol. XXV, 1963.

(Underdeveloped countries), c, d: *World Survey of Education*, Secondary Education-III, *UNESCO*.

a: Based on Table 5.

b: *International Year Book of Education.*

Note: i. Wherever essential, part-time teachers as well as part-time students are converted into full-time by equating two part-time teachers or students to one full-time teacher or student.

ii. Professional schools comprised of vocational schools and teacher training schools, whereas vocational schools alone exclude the latter (teacher-training schools).

TABLE 7

PROPORTION OF STUDENTS ENROLLED IN PROFESSIONAL SCHOOLS TO ENROLMENT IN NON-PROFESSIONAL SCHOOLS

Name of the Country and the Year of Statistics	*Enrolment in Non-Professional Schools*	*Enrolment in Professional Schools*	*Percentage of pupils in professional schools to pupils in non-professional schools*
1	2	3	4
I. Developed Countries			
a. Germany (1957-58) (Vocational Schools)	11,43,930		
b. Norway (1957-58) (Public Schools)	60,087	51,319	85·5
c. Sweden (1957-58)	19,93,92	94,449	47·4
d. France (1962-63)	71,10,00	25,65,00	36·7
II. Under-developed Countries			
a. Iran (1957-58)	18,88,03	10,596	5·6
b. India (1960-61)	30,81,134	4,01,274	9·4
c. Philippines (1957-58)	5,32,361	95,323	18·0
d. U.A.R. (1957-58)	4,42,461	89,396	20·2

SOURCES: Except for India and France, *World Survey of Education*, Secondary-III, *UNESCO*.

France—*International Year Book of Education*.

India—See Cols. 2 and 5, Table 4-A.

Note: Wherever necessary part-time students are turned into full-time students by equating two part-time students to one full-time student.

TABLE 8

PERCENTAGE ALLOCATION OF RECURRING EXPENDITURE ON NON-PROFESSIONAL AND PROFESSIONAL SCHOOLS

Name of the Country and the Year of Statistics	*Types of Schools*		
	General Education Schools	*Vocational Schools*	*Teacher Training Schools*
1	2	3	4
I. Developed Countries			
a. Sweden (1957-58)	62·5	29·0	8·5
b. Germany (1957-58)	61·9	39·1	Included in General Education Schools.
c. France (1957-58)	55·3	38·4	16·3
d. Netherlands (1957-58)	52·0	43·1	4·9
II. Under-developed Countries			
a. India* (1960-61)	83·1	11·7	5·2
b. U.A.R. (1958-59)	79·3	12·1	8·6
c. Iran (1958-59)	72·0	20·4	7·6
d. Philippines (1957-58)	52·0	48·0	...

SOURCE : *World Survey of Education, Secondary Education-III, UNESCO.*

*Based on the report on *Education in India*, Vol. I, Ministry of Education, Govt. of India.

Chapter Eight

Unit Costs of Education—A Case Study of Haryana Colleges

RUDDAR DATT*

Scope of the Study

The study of unit costs is important in two ways: It helps us to know the cost of creation of seats in educational institutions, and, secondly, it also enables us to know the cost of operation of the seats created. The estimate of the cost of creation of seats is generally referred to as capital cost of education and the cost of operation of seats as current cost of education. To find the capital cost of education, an estimate of the cost of building, equipment, furniture, cost of developing play grounds, installed water-works, etc., has to be computed. From Form B-1 of the Ministry of Education, it was not possible to make an estimate of the capital cost as the above Form makes a distinction between recurring and non-recurring items of expenditure, but the items of expenditure included pertain to the particular year for which statistics are supplied. Under the circumstances, the only course open was to study the annual budgets of colleges but most colleges prepared statements of income and expenditure of the current year and the statements of assets and liabilities were not prepared in a comprehensive manner.[1] In the absence of reliable and comprehensive data of assets and liabilities, it was decided not to attempt an estimate of capital cost of education, but to restrict the study to the current cost of education.[2]

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[1] Even when such statements were prepared, they included items like *provident fund, security deposits* and some grants received for projects for the current year on the liabilities side, and the nature of investments of these funds and deposits were shown on the assets side, along with cash in hand and interest payments.

[2] However, the author believes that though it is not possible to prepare an estimate of capital cost for the State as a whole with the existing state of statistics, an estimate of capital cost for one or two colleges is really worthwhile and can be attempted.

This study of current cost[3] of education is a point estimate pertaining to the year 1965–66 and thus it suffers from all the limitations of such studies. A time-series data would have ironed out some of the abnormalities in expenditure data that appear in a particular year, but again the non-availability of time series data and the limitations of an individual researcher were the compelling reasons to restrict the scope of the present enquiry to only one year.

The study covers the 'Arts Colleges' of Haryana only. The term 'Arts College' is being used to refer to the category of colleges which provide higher education in arts, science and commerce. The term higher education implies education after matriculation or higher secondary examination and thus includes pre-university courses in arts, science, commerce and agriculture along with degree courses in these branches of study.

Structure of Arts Colleges in Haryana

It would be of interest to describe the structure of Arts Colleges in Haryana. In 1965-66, there were in all 38 arts colleges in Haryana. 37 of them were affiliated to the Punjab University and one was affiliated to the Kurukshetra University. Out of these, 31 colleges were maintained by the privately aided governing bodies and 7 were run by the State Government. The privately aided colleges did receive some grant from the State Government, the University Grants Commission and Local Bodies, but since the amount of grant received from public funds by private colleges accounted for 14·3 per cent of the total expenditure, bulk of the cost of education, *i.e.*, 83·7 per cent was financed out of the income from fees. The governing bodies of colleges contributed barely 4·5 per cent of the total current costs.

Sample of Colleges included in the Study

Out of a total of 38 colleges in Haryana, 28 colleges have been included in the study. Data for only 28 colleges were available with the U.G.C. and hence they were included. Even then it would be of interest to examine whether the sample is fairly representative of the various groups of colleges included in the study.

Enrolment data according to Form B-4 of the U.G.C. reveals that the 4 State colleges included in the sample account for 58·5 per cent of the total enrolment in State Colleges; all the Private (Women's) College were included; and the 17 'other private colleges' included in the sample accounted for 64·4 per cent of the total enrolment in these colleges. Table 1 gives the details about the total number of colleges and those included in the sample along with their enrolment.

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[3] The term current costs is being used as synonymous with the use of the term variable costs. An effort has been made to exclude all items which are of a fixed nature, so that an estimate of the cost of operation of a seat in an educational institution at made.

TABLE 1

COLLEGES INCLUDED IN THE SAMPLE AND THEIR ENROLMENT[4]

S. No.	*Total Number of Colleges*	*Colleges included in the Sample (b)*	*Total Enrolment of (a)*	*Total Enrolment of (b)*	*Col. 4 as per of 3*
0	1	2	3	4	5
i. State Colleges	7	4	4,446	2,600	58·5
ii. Private (Women's) Colleges	7	7	1,861	1,861	100·0
iii. Other Private Colleges	23	17	16,174	10,423	64·4
iv. All Private Colleges (ii+iii)	30	24	18,035	12,284	68·1
All Colleges	37	28	22,481	14,884	66·2

Out of the 28 colleges included in the sample, 24 are maintained by privately aided governing bodies and 4 are being run by the State Government. Out of the 24 private colleges, 7 colleges impart *instruction* to girls only. Similarly, out of the 4 State Colleges, one is a women's college.

Another useful basis of classification is the type of courses offered in different colleges. 8 colleges imparted instruction in the Pre-University course (Arts) and B.A. (Arts). Out of these, 7 were women's colleges run by privately aided governing bodies. The sole exception was Dayanand College (Evening), Hissar. Another group of 8 colleges imparted instruction in the following courses: PUC (Arts and Science), B.A., B.Sc., Pre-engineering and Pre-medical. In 3 colleges, even a large number of courses were taught[5]. The remaining group of nine colleges could not be grouped under any category as they imparted instruction in different sets of courses.

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[4] Figures of enrolment about Government Girls College, Kurukshetra, were not available and hence have not been included.

The classification of colleges[6] on the basis of enrolment was as under:

TABLE 2

CLASSIFICATION OF COLLEGES ON THE BASIS OF ENROLMENT

S. No.	Enrolment	No. of Colleges
0	1	2
1.	Below 250	6
2.	Between 250 and 500	9
3.	Between 500 and 750	7
4.	Between 750 and 1,000	6
	TOTAL	28

Another method of classification is to determine the age of the college. On this basis the data of the sample could be summarized as under:

TABLE 3

CLASSIFICATION OF COLLEGES ACCORDING TO AGE

S. No.	Age of the College	No. of Colleges included in the Sample	Total Number of Colleges in Haryana
0	1	2	3
1.	Below 5 years	5	6
2.	Between 5 and 10 years	7	9
3.	Between 10 and 20 years	12	17
4.	20 years and above	4	6
	TOTAL	28	38

An interesting result of the age structure is the fact that but for 6 colleges,[7] all the other colleges in the State were established after inde-

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[5] Strangely enough, K. L. Public College, Rewari, with its strength of 317 students only was conducting the largest number of courses as compared with any college in the State, namely, PUC (Arts, Science and Commerce), B.A., B.Sc., B.Com., Pre-medical and Pre-engineering.

[6] The college with the largest number of students included in the sample was Dayanand College, Hissar, with its strength of 929 students and the college with the smallest strength of 136 students was Hindu Girls College, Jagadhri.

[7] These colleges are: Government College, Rohtak (1927), S.A. Jain College, Ambala City (1938), A.I. Jat Heroes Memorial College, Rohtak (1944), Vaish College, Bhiwani (1944), Ahir College, Rewari (1945) and Vaish College, Rohtak (1946).

pendence. The existence of 6 colleges to impart college education in this part of the Punjab (now called Haryana) needs no comment about the state of underdevelopment in the sphere of higher education.

Sources of Data and the Problems

Two sources of information of college statistics are Form B-4 of the University Grants Commission and Form B-1 of the Ministry of Education relating to statistics of colleges in India. Form B-4 was not of much use to our study except that it contained figures of enrolment in various types of courses and the distribution of teachers according to subjects and designations. But the information contained in Form B-1 related to 15th August 1965, *i.e.*, the close of admission. Therefore, it was observed that figures of enrolment supplied by colleges in Form B-4 were generally higher than those given in Form B-1. (The figures in Form B-1 pertain to 31st March 1966.) The difference could be explained primarily by the number of drop-outs, to some extent by migrations and partly by shifts to employment in view of their inability to pursue studies on account of poverty or incompetence. Some drop-outs could be explained by the failure of those students who were promoted under the 'compartment' or 'exemption' condition in one or more subjects[8].

In Table 4, we give the figures of enrolment as given in Form B-4 and Form B-1.

TABLE 4

FIGURES OF ENROLMENT AT THE CLOSE OF ADMISSION AND AT THE CLOSE OF FINANCIAL YEAR

S. No.	*Category of Colleges*	*Enrolment as given in Form B-4*	*Enrolment as given in Form B-1*	*Difference*
0	1	2	3	4
1.	State Colleges	2,600	2,464	— 136
2.	Private (Women's) Colleges	1,861	1,749	— 112
3.	Other Private Colleges	10,423	9,527	— 896
	TOTAL	14,884	13,740	— 1,144

The total enrolment according to Form B-4 works out to be 14,884 and according to Form B-1, 13,740. Figures in Form B-1 are supplied after the completion of the financial year, *i.e.* as on March 31 as this form is supposed to contain information about the income and expenditure of the college for the year in question. Thus, the enrolment figures in Form B-1 indicate capacity utilized in the particular year. The difference between total enrolment as given in Form B-4 and Form B-1 is of the order of about 8 per cent. Enrolment at the time of admission gives the ' capacity created '.

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[8] According to the Punjab University, a student who fails to secure a prescribed percentage of marks in the combined result of September and December Examinations of the college cannot be admitted to the examination conducted by the University. As in the 3-year degree course, a student has to undertake a university examination every year, the number of students who have to drop-out under this regulation is fairly large.

Which of these two figures of enrolment should form the basis of calculation of unit costs of education? If we use the figures at the close of admission, we run the risk of underestimating unit cost because many of the students whom we had assumed would continue their studies, cut short their education. If we use the figures at the close of the financial year, the risk of slightly over-estimating the unit cost is there because some of the students who actually studied for a part of the year have not been included. One way of resolving the difficulty is to take the ' mean ' of the two enrolment figures. This procedure is based on the assumption that those who discontinue their studies have spent nearly half of the year in the college. This assumption is too arbitrary. A better procedure would be to make a sample study of such students and adjust the unit cost of education accordingly. Although such an attempt would be worthwhile, it has not been attempted presently. The method adopted in the study is to calculate two variants of unit cost, one with the enrolment in Form B-4 and the other with the enrolment in Form B-1 and then calculate a range of the unit cost. The upper limit would thus indicate unit cost with ' full utilization of capacity created ' and the lower limit would indicate unit cost with ' actual utilization of capacity '.

In this paper, both the variants of unit cost of education have been calculated, but for detailed examination of the various elements of unit cost, the figures of Form B-1 have been made use of.

Nature of Data and the Necessary Adjustments

Statistics about income and expenditure have been taken from Form B-1 of the Ministry of Education. Since the form has not been designed to suit the needs of data regarding unit cost, some adjustments had to be made. Secondly, no clear instructions in the form of footnotes to various tables are given in Form B-1. As a result, several discrepancies in the filling up of forms were noticed.

Although every possible effort was made to remove discrepancies of data, still it cannot be claimed that it was possible to detect all of them. As we discuss the items to be included in unit cost, we shall also reveal the problems noted for adjustment.

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Salary of Teaching and Non-Teaching Staff. The term teaching staff includes the principal, senior lecturers, lecturers, part-time lecturers[9] and demonstrators in unit cost studies, but in Haryana, the term is extended to cover even the Director of Physical Education and the Librarian. The DPE is not concerned with the imparting of instruction as such and so performs a co-curricular activity. It can also be argued that although the librarian performs a service which is directly related to instruction yet he is to be classified as a member of the non-teaching staff. Wherever, the break-up of the teaching staff included either the librarian or the DPE, we have excluded the salary due to them on a proportionate basis and allocated it to the non-teaching staff.[10]

Provident fund contribution is shown under the head ' miscellaneous '. In the view of the author, it is a legitimate part of the salary. Since a consolidated figure of provident fund was given, it was decided to allocate this to the salary of the teaching and non-teaching staff in the ratio of their respective amounts.

Equipment. Expenditure on equipment related to apparatus, chemicals and stores and furniture. In studies of current costs, only the repair of furniture should be taken into account. All apparatus of a capital nature should be excluded. But since Form B-1 classifies expenditure into recurring and non-recurring items, it cannot be conclusively stated that items of capital nature have been separately shown in non-recurring expenditure.[11]

Miscellaneous Items of Expenditure. In Form B-1 miscellaneous items included stipends and other financial assistance, fee concessions, library, games and sports, hostels, repair of buildings, contingencies and other items such as entertainment, common room, prize-giving function, audit fee, rent of hired premises, printing and stationery, postage, electric charges etc. It would be necessary to discuss this head in detail as it was subjected to various adjustments.

i. It may be pointed out that in Haryana most of the colleges charge Rs. 5 per month per student as amalgamated fund fee. This fee is used for financing expenditures of library, games and sports, educational tours, cultural activities of various clubs and societies of students and house examinations. The data supplied by some colleges have separately stated the figures of various items, but quite a few of them have lumped it in one figure under the heading, ' expenditure out of amalgamated fund'. Inquiries addressed to various colleges were not replied and thus there was a difficulty of allocating this expenditure between ' miscellaneous items related to instruction ' and ' expenditure on co-curricular activities '. On account of this difficulty, it was deemed desirable not to calculate the cost of instruction per student. However, the distinction between cost of instruction and total cost of education serves one purpose *i.e.*, it indicates expenditure incurred on co-curricular activities. If the purpose of education is to impart training to a student so as to develop into a useful citizen and not merely to impart instruction to enable him to secure a degree, then the expenditure on co-curricular activities is of great significance. Judged from this standpoint, there are colleges which seem to be spending practically nothing to develop the other aspects of students' personality. More especially in women's colleges, leaving one or two exceptions, practically nothing is being spent on this item. The expenditure under this head varied from 0·3 per cent to 16·2 per cent of total expenditure in different colleges.

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[9] There is also the practice of appointing part-time lecturers in Haryana. A part-time teacher taking between 6-12 periods a week is entitled to a consolidated salary of Rs. 200. We have treated two part-time teachers as equivalent to one full-time teacher for purposes of our calculations. A full-time teacher takes a teaching load of 24 periods per week.

[10] Incidentally it may be pointed out that the salary scales of the trained librarian and DPE are the same as those of the college lecturer.

[11] Expenditure on this item has varied between 0·2 per cent to 12·5 per cent in different colleges. Some colleges have not shown any expenditure under this head. On account of the difficulties of adjustment under this head, it was decided to accept the expenditure figures as supplied by the colleges.

ii. Fee concessions granted to students have been shown as expenditure. From the accounting point of view, this procedure is valid, but we have excluded them for the sake of uniformity. Only a few colleges had shown fee concessions as an item of expenditure, others had shown tuition fees net of fee concessions. Consequently, fee concessions have been excluded.

iii. Expenditure on the maintenance of hostels has been excluded. Hostels are treated as a business enterprise and income and expenditure on this account has been deducted from both sides. Since our study of unit costs does not include cost of maintenance of the student, it was not considered desirable to include the income and expenditure of hostels. The purpose of hostels is to provide board and lodging to students. Since the expenditure by non-residents on this item was not included, it was proper to exclude this item.

iv. Under the repair of buildings some colleges had shown the rent of hired premises. They had also shown expenditure on the repair of buildings separately. The rent of hired premises has been excluded on the assumption that every college is supposed to have a building of its own, and that the only item which can legitimately be allocated to current costs of education is repair of building.

v. University examination fee has not been included in the calculation of unit cost. If an estimate of total cost of education is made, it is necessary to include this item but since the purpose of the present study is to estimate the cost of operation of a seat in an educational establishment it was decided to exclude this item.

vi. The expenditure on library books and library equipment poses another problem. The stock of books in a college library can be treated as a capital stock because of the durability of the stock. Another view held in this connection is that colleges are required to spend every year on the library and that such expenditures are vitally necessary every year, both from the point of view of teachers and students. We have, therefore, included the expenditure on books in the current cost of education. Wherever expenditure on library equipment was given separately, it was excluded from current cost as it is an item of a capital nature, but in many colleges, the expenditure on library equipment was not shown separately and so could not be adjusted accordingly.

vii. College examination fee has, however, been included because it is a part of the regular college expenses and is an instructional activity.

viii. Expenditure on scholarships, stipends and other financial assistance received from various sources was treated as a transfer item and hence excluded from either side of income or expenditure.

Form B-1 Part III includes income and expenditure on items for which accounts are maintained separately from those of regular college accounts. The purpose of this classification is to study college finances for purposes of eligibility of government grants. This included college examination fee, magazine fee, medical fee, etc. Out of these items medical fee was allocated to co-curricular activities expenditure. Similarly, expenditure on N.C.C., games and sports was also included in co-curricular activities expenditure.

On the income side, Form B-1 divides the recurring items into (*a*) Public funds which include grants received from the Central Government, the UGC, the State Government, the University and Local Boards; (*b*) Fees; (*c*) Endowments; and (*d*) other sources. From the point of view of analysis of unit costs, certain adjustments had to be made in this classification.

Firstly, the contributions by the Governing Body to current costs are not specifically shown. Some colleges have shown such contribution as donations. In some colleges, the Governing Bodies of colleges receive income from investments of endowment funds. Donations, investment-income of endowment funds, interest received on deposits and rent of property hired out by the Governing Body constitute its legitimate income.

Secondly, many colleges grouped together under the head 'fees', all income received from tuition fee, admission fee, library and reading room fee, medical fee, magazine fee, house examination fee, science fee, cycle fee, identity card fee, printing and stationery fee, electric fee, garden fee, dilapidation fee, music fee, games and sports fee, etc. Although tuition fee is collected on a monthly or bimonthly basis in colleges, several other fees are collected on a yearly basis and so have been shown under the head 'Annual Charges'. Similarly, fees charged under the head 'Amalgamated Fund' also cover quite a good number of items. The purpose of grouping all these items together is to know the 'private cost' of current education because these fees are paid by the recipients of education.

Thirdly, income from public sources includes grant from the State Government, UGC and Local Boards. Only such grants which are received for 'maintenance purposes' have been allocated under this head.

Fourthly, 'other sources' include income from fines, sale of prospectus, salary forfeited in lieu of notice period, sale of old newspapers and magazines, sale of grass etc.

Notations Used

Enrolment or total number of students = N
Total number of teachers = n
Pupil-teacher ratio = N/n
Salaries of teaching staff = T
Salaries of non-teaching staff = A
Total salary costs = $T+A$
Expenditure on equipment = Q
(Equipment includes expenditure on apparatus, chemicals and stores and repair of furniture.)
Miscellaneous expenditure = M
(Miscellaneous expenditure includes library and reading room, magazine, college house examination, repair of buildings, contingencies and other items.)
Total cost of instruction = $Ci = (T+A+Q+M)$
Expenditure on co-curricular activities = J

$$\text{Total cost of education} = (Ci+J) = C$$
$$= (T+A+Q+M+J)$$

Non-teacher costs $= (A+Q+M+J) = C - T$

Ratio of non-teacher to total costs $= \dfrac{C-T}{C}$

Average pay of a teacher $= T/n$

Teacher cost per student $= T/N$

Salary cost per student $= \dfrac{T+A}{N}$

Unit Cost of Education $= UC = \dfrac{(T+A+Q+M+J)}{N}$

Total income $= Y$

A. Government funds $= G = g_1+g_2+g_3$
  i. State government funds $= g_1$
  ii. UGC funds $= g_2$
  iii. Local Board funds $= g_3$
B. Governing Body contribution $= B$
C. Fee income $= F$
D. Other sources (fines, sale of prospectus etc.) $= S$
  $y = (G+B+F+S)$

Factors Affecting Unit Cost of Education

Unit cost of education depends upon several factors. All these factors are conditioned by the attitude of those authorities which are directly or indirectly concerned with the running of these institutions. In the case of privately aided colleges, the attitudes of the Governing Bodies largely affects costs of education. These attitudes are conditioned to some extent by the rules of regulations which the State Governments or the UGC or the University may enforce from time to time. Whereas in the case of privately managed colleges, an effort is made to keep the total costs at a level which imposes minimum burdens on the Governing Bodies, the State colleges generally do not function under this constraint. Subject to the above mentioned qualifications the following factors are relevant to unit costs.

Age of the College. A college requires a few years to mature. This depends upon the type of courses started and the time-period of each course. Moreover, it has been observed that some colleges in the initial phase start Arts Courses, and after some years add Science courses to the existing courses. Sometimes, pre-university (Arts or Commerce) or pre-engineering or pre-medical classes may be started initially and later on degree classes in the corresponding faculties may be added. One can assume that a college may require a period of 7 to 10 years to reach its peak enrolment capacity. Thus, age of the college does affect enrolment upto a point and this in turn may tend to reduce unit costs.

In a younger college, the average length of service of a teacher tends to be lower than that in an older college. Experienced teachers, other things being equal, tend to be retained and attracted by older colleges. Thus, the age of the college tends to affect unit costs positively because it has a built-in tendency to raise average pay of a teacher. But in such privately managed colleges, where service conditions are insecure, one can notice the phenomenon of the frequent shifts of teachers to better colleges or to State managed colleges where service conditions are relatively much more secure. Thus, the age of the college may also be negatively correlated to unit costs, if service conditions in a college or a group of colleges are very insecure.

In the initial years, colleges emphasize on the provision of facilities of teaching, and emphasis on expansion of library facilities, development of play grounds, organization of co-curricular activities comes later. Consequently, with the passage of time, expenditure on co-curricular activities increases as more attention is paid to them and this tends to increase unit cost.

Enrolment. Cost of education is affected by enrolment. Enrolment depends upon the type of courses offered by a college, its reputation, number of other colleges in the town or area, size of the town and other feeding areas in its vicinity, general level of economic and educational development attained by the region, etc. An increase in enrolment leads to a fuller utilization of the indivisible factors and thus tends to lower unit costs. Since we have in our sample colleges with different sizes of enrolment, the question worth examination in this connection is: Given other factors, does an increase in enrolment lead to a decline in unit cost?

Average Pay of Teacher. Teacher costs are a major component of unit costs. They account for 58·0 per cent of total costs for all colleges.[12] The average pay of the teacher is a composite variable which reflects many factors that comprise teacher costs, *i.e.*, levels of pay, pay scales and other allowances prevalent at a particular time, composition of teachers in various grades, average length of service of a teacher in the institution, the attitude of the governing body about recruitment of teachers, the type of courses started by the institution etc. Average pay of the teacher (T/n), divided by the pupil-teacher ratio (N/n) gives the teacher cost per student (T/N) which is a major component of unit costs. Thus the average pay of the teacher, by affecting teacher cost per student tends to influence unit costs. One can expect that an increase in average pay of the teacher should be positively correlated with unit costs.

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[12] Teacher costs as a percentage of total costs range from 47·0 per cent to 77·4 per cent in the sample of colleges included in this study.

Ratio of Non-Teacher to Total Costs. Non-teacher costs include salaries of administrative and other non-teaching staff, expenditure on equipment, chemicals and stores, other miscellaneous expenditure and the expenditure on co-curricular activities. As the age of the college advances, and enrolment improves, more of administrative staff is needed. Besides this, library and reading room facilities, games and sports, other co-curricular activities are enlarged to meet the demands of the enlarged population of students. It is quite probable that with an enlargement of enrolment, non-teacher costs per student may decline and this may tend to reduce unit cost. But if the institution plans to diversify the sphere of curricular and co-curricular services, it is quite likely that the expenditure on non-teacher costs as a proportion of total costs may rise. This, in turn, can affect unit cost positively.

The influence of various factors affecting unit costs (UC) expresses itself through these four variables viz., Age of the College (K), Enrolment (N), Average pay of the teacher (T/n) and Ratio of non-teacher to total costs $\frac{(C-T)}{C}$. On the basis of the likely effects on unit costs by these variables, it may be worthwhile to test the following hypotheses:

Age of the college should be positively correlated with N, T/n and $\frac{C-T}{C}$

N may tend to be negatively correlated with UC;

T/n should be positively correlated with UC;

$\frac{C-T}{C}$ may tend to be positively correlated; and with UC it may show a negative correlation as well if the financial constraints on the development of curricular and co-curricular services associated with teaching have a strongly depressing effect.

The correlation between the age of the college and unit cost may be positive or negative depending upon the resultant of the relative influences of (i) N on UC in the downward direction and of $\frac{T}{n}$ and $\frac{C-T}{C}$ on UC in the upward direction.

Regression and Correlation Analysis of Unit Costs

In order to study the effect of the above mentioned four variables on unit cost, regression analysis was conducted. The unit cost of education (y) (the dependent variable) was associated with 4 independent variables by the following equation:

$$y = L + B_1(N) + B_2(K) + B_3(T/n) + B_4\frac{(C-T)}{C}$$

This yielded the following results.

TABLE 5

RESULTS OF REGRESSION ANALYSIS

All Colleges (28)	*Level of Significance*
1	2
L = —12·10	t_1 = 1·858 Significant at 10% level
B_1 — 0·12	t_2 = 0·983 ....
B_2 1·74	t_3 = 3·485 At 1% level
B_3 0·07	t_4 = 1·970 At 10% level
B_4 0·25	
R — Bar — Square = 0·46	
R — Square = 0·56	
R = 0·75	
F — Value = 7·22	Significant at 1% level
All Private Colleges (24)	*Significant at*
L = — 18·01	t_1 = 2·260 At 5% level
B_1 = — 0·09	t_2 = 2·170 At 5% level
B_2 = — 3·25	t_3 = 4·890 At 1% level
B_3 = 0·46	t_4 = 4·814 At 1% level
B_4 = 0·41	
R — Bar — Square = 0·46	
R — Square = 0·75	
R = 0·86	
F — Value = 13·90	Significant at 1% level

Regression analysis reveals that in case of private colleges, enrolment and age of the college had a negative impact on unit costs; and average pay of the teacher and ratio of non-teacher to total costs indicated positive impact. But when to the sample of 24 private colleges, 4 state colleges were added, the sample of all colleges showed that the age of the college instead of showing a negative impact, showed a positive impact. One probable explanation for this shift in the effect of age of the college on unit costs is that teachers in government colleges tend to continue in service once they enter government service, but the shifts of teachers in private colleges are more frequent. Thus the influence of state colleges resulted in a positive impact on age of unit costs.

Although F values in both samples show 1 per cent level of significance, the sample of private colleges showed a higher value of the coefficient of correlation (*R*).

R^2 indicates 75 per cent of the variations in the case of private colleges, but the introduction of 4 state colleges[13] reduced the degree of explained variation to 56 per cent.

Correlation analysis suggests that while the association of all the variables with unit cost is significant in case of 'all colleges', it is not so in the case of private colleges. The influence of N on unit cost shows a significance only at 10 per cent level while age of the college depicts a very weak association in the private colleges.

TABLE 6

CORRELATION OF DIFFERENT VARIABLES WITH UNIT COST OF EDUCATION

S. No.		*Coefficient of Correlation (r)*	*t-value*	*Level of Significance*
0	1	2	3	4
1.	*All Colleges*			
	UC and N	·43	2·44	Significant at 2·5% level
	UC and K	·48	2·81	Significant at 1% level
	UC and T/n	·68	4·71	Significant at 1% level
	UC and $\frac{C-T}{C}$	·40	2·26	Significant at 5% level
2.	*Private Colleges*			
	UC and N	·32	1·61	Significant at 10% level
	UC and K	·16	·77	...
	UC and T/n	·59	3·43	Significant at 1% level
	UC and $\frac{C-T}{C}$	·63	3·85	Significant at 1% level

Partial correlation analysis of all colleges suggests that enrolment should be significantly correlated if other factors are held constant. Similarly, the effect of the average pay of teacher is highly significant, but age of the college is not significantly associated with unit cost. Nor is the association of ratio of non-teacher to total costs with unit costs highly significant.

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[13] It was not possible to study correlation for State Colleges separately, as the data pertained to 4 colleges only.

TABLE 7

PARTIAL CORRELATION OF DIFFERENT VARIABLES WITH UNIT COST OF EDUCATION

S. No.		Coefficient of Partial Correlation (r)	t-value	Significant at
0	1	2	3	4
1.	*All Colleges*			
	UC and N	·55	3·12	1% level
	UC and K	·35	1·81	10% level
	UC and T/n	·59	3·45	1% level
	UC and $\frac{C-T}{C}$	·38	1·97	10% level
2	*Private Colleges*			
	UC and N	·54	2·81	1% level
	UC and K	—·21	·91	...
	UC and T/n	·75	4·87	1% level
	UC and $\frac{C-T}{C}$	·74	4·81	1% level

In case of Private Colleges, partial correlation analysis suggests a high degree of significance for T/n and $\frac{C-T}{C}$ and N, but the influence of age of college is negatively associated and is also insignificant.

The author is conscious of the fact that the number of observations was small and so the results of correlation analysis should be regarded primarily of illustrative significance.

Analysis of Unit Cost of Education

A close examination of Table 8 reveals that cost per student is lower in Private (women's) Colleges than in 'Other Private Colleges'. In other words, unit cost is the highest in State Colleges, next in order are 'Other Private Colleges' and Private (Women's) Colleges respectively. The differences in unit costs amongst these three categories can be largely explained in terms of salary cost per student. In State Colleges, which had only 17·9 per cent of enrolment, teacher and non-teacher salaries accounted for 24·5 per cent and 26·2 per cent of the respective total under these heads for all colleges. In 'Other Private Colleges', in comparison with 69·4 per cent enrolment, teacher and non-teacher salaries were 64·0 and 67·4 per cent; while in Private (Women's) Colleges, as against 12·7 per cent enrolment, teacher and non-teacher salaries were 11·5 and 6·5 per cent of total salary cost under respective heads for all colleges.

TABLE 8

RELATIVE IMPORTANCE OF THE VARIOUS COMPONENTS OF UNIT COSTS OF EDUCATION FOR VARIOUS CATEGORIES OF COLLEGES

(In Rs

S. No.	*Head*	*State colleges*	*Private (women's) colleges*	*Other private colleges*	*All private colleges*	*All college*
0	1	2	3	4	5	6
1.	Enrolment (No.)	2,464 (17·9)	1,749 (12·7)	9,527 (69·4)	11,276 (82·1)	13,740 (100·0)
2.	Teacher strength (No.)	141 (21·8)	87·5 (13·5)	418·5 (64·7)	506 (78·2)	647 (100·0)
3.	Pupil-Teacher ratio	17·5	20·0	22·8	22·3	21·2
4.	Teacher salaries	6,58,966 (24·5)	308,463 (11·5)	17,17,318 (64·0)	20,25,781 (75·5)	26,84,747 (100·0)
5.	Non-teacher salaries	1,69,470 (26·2)	40,883 (6·4)	4,35,497 (67·4)	4,76,380 (73·8)	6,45,850 (100·0)
6.	Equipment, furniture etc.	40,311 (16·6)	3,082 (1·3)	1,99,755 (82·2)	2,02,837 (83·4)	2,43,148 (100·0)
7.	Misc. expenditure	1,30,220 (17·0)	1,02,637 (13·4)	5,33,095 (69·6)	6,35,732 (83·0)	7,65,952 (100·0)
8.	Total cost of instruction	9,98,967 (23·0)	4,55,065 (10·5)	28,85,665 (66·5)	33,40,730 (77·0)	43,39,697 (100·0)
9.	Expenditure on co-curricular activities	47,579 (16·3)	13,256 (4·6)	2,30,580 (79·1)	2,43,845 (83·7)	2,91,415 (100·0)
10.	Total cost of education	10,46,546 (22·6)	4,68,321 (10·1)	31,16,245 (67·3)	35,84,566 (77·4)	46,31,112 (100·0)

Note: Figures in brackets represent percentages of total for all colleges for various heads.

A comparative statement of certain components of unit costs is given in Table 9.

TABLE 9

PERCENTAGE CONTRIBUTION OF VARIOUS COMPONENTS OF COSTS TO TOTAL COSTS OF EDUCATION FOR DIFFERENT CATEGORIES OF COLLEGES

S. No.	*Head*	*State Colleges*	*Private (Women's) Colleges*	*Other Private Colleges*	*All Private Colleges*	*All Colleges*
0	1	2	3	4	5	6
a.	Teacher salaries	62·9	65·9	55·1	56·6	58·0
b.	Non-teaching staff salaries	16·2	8·7	14·0	13·3	13·9
c.	Expenditure on equipment	3·9	0·7	6·4	5·6	5·2
d.	Miscellaneous expenditure	12·5	21·9	17·1	17·7	16·5
e.	Cost of instruction	95·5	97·2	92·6	93·2	93·7
f.	Expenditure on co-curricular activities	4·5	2·8	7·4	6·8	6·3
g.	Total cost of education	100·0	100·0	100·0	100·0	100·0

Taking all colleges together, 58 per cent of the total cost was represented by teacher salaries and 13·9 per cent by non-teacher salaries. In other words, the salary component of cost was about 72 per cent of total cost. Expenditure on equipment and miscellaneous items accounted for 21·7 per cent of total cost of education. Thus the cost of instruction was 93·7 per cent and barely 6·3 per cent was spent on co-curricular activities.

However, in State Colleges, teacher salaries accounted for 62·9 per cent and non-teacher salaries were 16·2 per cent. In other words, salary component of the cost of education was 79·1 per cent of total costs. The expenditure on equipment and miscellaneous items was 16·4 per cent and thus the cost of instruction was 95·5 per cent of total costs. Barely 4·5 per cent was spent on co-curricular activities.

In Private (Women's) Colleges and 'Other Private Colleges', teacher salaries accounted for 65·9 per cent and 55·1 per cent of total costs, non-teacher salaries accounted for 8·7 per cent for Private (Women's) Colleges and 14·0 per cent for 'Other Private Colleges'. Although the average pay of the teacher was the lowest in Private (Women's) Colleges, yet the proportion of teacher salaries to total costs was the highest. The reason for this situation is that all costs are low in women's colleges because these colleges run only Arts courses and so teacher costs as a proportion of total costs is the highest.

Taking all private colleges together, salary costs represent 69·9 per cent of total costs, out of which teacher costs represent 56·6 per cent. Equipment and miscellaneous items account for 23·3 per cent. Thus the cost of instruction works out to be 93·2 per cent and expenditure on co-curricular activities is 6·8 per cent of total costs. Strangely enough, the co-curricular activities are patronized more in 'Other Private Colleges'. They are practically non-existent in Private (Women's Colleges and in State Colleges, they receive relatively less importance.

Two variants of Unit Cost of Education were calculated.

TABLE 10

UNIT COST OF EDUCATION—VARIANT I

Basis: Enrolment Figures at the Close of Admission, i.e., 15th of August, 1965 as Given in Form B-4

(In Rs.)

S. No.	*Head*	*State Colleges*	*Private (Women's) Colleges*	*Other Private Colleges*	*All Private Colleges*	*All Colleges*
0	1	2	3	4	5	6
1.	Teacher cost per student T/N	253	165	165	165	180
2.	Salary cost per student T+A/N	319	188	207	204	224
3.	Unit cost of education C/N	403	252	290	292	311

TABLE 11

UNIT COST OF EDUCATION—VARIANT II

Basis: Enrolment Figures at the Close of Financial Year, i.e., 31st of March, 1966 as Given in Form B-I

(In Rs.)

S. No.	*Head*	*State Colleges*	*Private (Women's) Colleges*	*Other Private Colleges*	*All Private Colleges*	*All Colleges*
0	1	2	3	4	5	6
1.	Teacher cost per student T/N	267	176	180	179·6	195
2.	Salary cost per student T+A/N	336	200	226	222	242
3.	Unit cost of education C/N	425	268	327	318	337
4.	Fee cost per student	228	209	276	266	259
5.	Average pay of teacher	4,674	3,525	4,103	4,004	4,190

The calculations revealed that unit cost of education was the highest in the case of State Colleges *i.e.*, Rs. 403–425; the second in order were 'Other Private Colleges' with unit cost of Rs. 290–327 and Private (Women's) Colleges had the lowest unit cost of Rs. 252–268. For all colleges of Haryana, unit cost of education works out to be Rs. 311–337, (Refer to Tables 10 and 11).

It may also be noted that the teacher cost per student, salary cost per student and average pay of the teacher also exhibit the same order of magnitude. They are the highest in State Colleges, next come the 'Other Private Colleges' and Private (Women's) Colleges have the lowest magnitudes in them. But the behaviour of fee cost per student is in a different order. Fee cost per student is the highest in 'Other Private Colleges', (Rs. 276) then come State Colleges (Rs. 228) and lowest fee cost per student is shown by Private (Women's) Colleges (Rs. 209). Actually one expects fee cost per student would be the lowest in State Colleges because the rates of fees charged in them are relatively low as compared with those charged in private colleges, but on account of the existence of Science Courses where fees other than tuition fee are higher, fee cost per student in State Colleges becomes higher than that in Private (Women's) Colleges which impart instruction in B.A. (Arts) and PUC (Arts) only.

Financing the Cost of Education

Broadly speaking, there are four sources of finance for education, viz., (i) Fee income, (ii) Government grants (State, UGC and Local Boards),

(iii) Other sources (fines, sale of prospectus, etc.), and (iv) Governing Body contribution.

Taking all sources together, (Refer Table 12) State Colleges accounted for 21·2 per cent of total income to all colleges from all sources, whereas

TABLE 12

SOURCES OF FINANCE FOR COSTS OF EDUCATION IN DIFFERENT CATEGORIES OF INSTITUTIONS

(In Rs.)

S. No.	Head	*State Colleges*	*Private (Women's) Colleges*	*Other Private Colleges*	*All Private Colleges*	*All Colleges*
0	1	2	3	4	5	6
1.	State Government	4,71,519 (57·1)	66,652 (8·0)	2,88,009 (34·9)	3,54,661 (42·9)	8,26,180 (100·0)
2.	U.G.C.	... ...	9,574 (8·2)	1,06,782 (91·8)	1,16,356 (100·0)	1,16,356 (100·0)
3.	Local Boards	... ...	12,000 (29·3)	29,000 (70·7)	41,000 (100·0)	41,000 (100·0)
4.	Total State Funds	4,71,519 (47·9)	88,226 (9·0)	4,23,791 (43·1)	5,12,017 (52·1)	9,83,536 (100·0)
5.	Governing Body	... ...	25,911 (12·0)	1,89,844 (88·0)	2,15,755 (100·0)	2,15,755 (100·0)
6.	Total of 4 and 5	4,71,519 (39·3)	1,14,137 (9·5)	6,13,635 (51·2)	7,27,772 (60·7)	11,99,291 (100·0)
7.	Fee Income	5,61,120 (15·8)	3,65,495 (10·2)	26,33,449 (74·0)	29,98,944 (84·2)	35,60,064 (100·0)
8.	Other Sources	13,907 (8·3)	6,317 (3·8)	1,47,271 (87·9)	1,53,588 (91·7)	1,67,495 (100·0)
9.	Total Income	10,46,546 (21·2)	4,85,949 (9·9)	33,94,335 (68·9)	38,80,304 (78·8)	49,26,850 (100·0)
10.	Total Cost of Education	10,46,546 (22·6)	4,68,321 (10·1)	31,16,245 (67·3)	35,84,566 (77·4)	46,31,112 (100·0)
11.	Total Enrolment	2,464 (17·9)	1,749 (12·7)	9,527 (69·4)	11,276 (82·1)	13,740 (100·0)

Note: Figures in brackets show percentages of total for all colleges for various sources.

they accounted for 17·9 per cent of total enrolment. As against it all private colleges accounted for 78·8 per cent of income from all sources with 82·1 per cent of total enrolment. But fee income in State colleges is 15·8 per cent of total fee income from all colleges. This is accounted for by two main factors: Firstly, the level of fees in State colleges is lower than in private colleges and, secondly, fee concessions are granted in State Colleges to the maximum permissible limits whereas private colleges adopt a closed-fist policy in this regard.

Of the total State funds, 4 State colleges accounted for 47·9 per cent of the total and remaining 24 colleges received 52·1 per cent of the total government grant. Since the State acts as the Governing Body of the State Colleges, it would be appropriate to take total income from State funds and the Governing Body contribution together. Even in this situation, the contribution of the community to the State Colleges is 39·3 per cent of the contribution to all colleges and that to private colleges is 60·7 per cent. In other words, the attitude of the State Government in helping the Private Colleges has not been favourable and consequently, the Private Colleges deliberately try to depress the costs of education and maintain the institutions within the funds that are made available from fees and public sources with least amount of burden to the Governing Body. This is evident from Table 13.

TABLE 13

PERCENTAGE CONTRIBUTION BY DIFFERENT SOURCES TO THE TOTAL COST OF EDUCATION

S. No.	*Sources*	*State Colleges*	*Private (Women's) Colleges*	*Other Private Colleges*	*All Private Colleges*	*All Colleges*
0	1	2	3	4	5	6
a.	State Government	45·1	14·2	9·2	9·9	17·8
b.	U.G.C.	...	2·0	3·4	3·2	2·5
c.	Local Boards	...	2·6	1·0	1·2	2·5
d.	Total State Funds	45·1	18·8	13·6	14·3	21·2
e.	Governing Body	.	5·5	6·1	6·0	4·7
f.	Fee Income	53·6	78·1	84·5	83·7	76·9
g.	Other Sources	1·3	1·4	4·7	4·8	3·6
h.	Total income as percentage of total expenditure	100·0	103·8	108·9	108·3	106·4

In case of State Colleges, fee income represents 53·6 per cent of the total cost of education, state funds 45·1 per cent and other sources 1·3 per cent. The question of any surplus arising in such colleges cannot be there, because the balance after deducting fee income from other sources is met by the State.

In case of Private (Women's) Colleges, fee income accounts for 78·1 per cent of the total cost of education, 18·8 per cent represents grants from State Governments, UGC and Local Boards; 1·4 per cent is contributed by other sources and 5·5 per cent by the Governing Bodies.

In this way, total income from various sources is 103·8 per cent of the total expenditure. There is, therefore, a surplus that emerges to the governing bodies. In other words, with a little contribution, (1·7 per cent) the Governing Bodies can meet the entire current expenditure of running the colleges.

In case of 'Other Private Colleges', fee income accounts for 84·5 per cent of total cost of education, 13·6 per cent is represented by Government grants and 4·7 per cent by other sources. The contribution of the Governing Body is 6.1 per cent. In this way, total income from various sources is 108·9 per cent of total expenditure. There is a surplus of 8·9 per cent which implies that even if the contribution of the Governing Body were nil, there shall be a surplus of 2·8 per cent. Evidently, in private colleges, there is a deliberate effort to maintain the operational expenses of the institutions within fee income and government grants. There is no doubt that the Governing Bodies of privately managed colleges were responsible for making a block capital expenditure as a promotional effort for these institutions, but after that, they tried to make educational institutions under their charge self-financing, irrespective of the criteria of maintaining efficiency and better educational standards.

Chapter Nine

Cost of Education in Commerce Colleges of Bombay 1962-63 to 1966-67

G. B. KULKARNI

Commerce education at the College/University stage has expanded a great deal during the last few years, both in Bombay and the country as a whole. The Sydenham College of Commerce and Economics, Bombay, established in 1913 was practically the only college of commerce for about 25 years in the whole of India and probably in the whole of South East Asia. Quite a few new commerce colleges came up after 1937 and the increase in the number of commerce colleges as well as of their students has been specially large during the last 10 years or so. Thus, in Bombay City alone, the number of commerce colleges has gone up from 3 to 8, the number of their students rising from about 3,000 to about 7,000. This is partly due to the rapid increase in the number of matriculates seeking admission to colleges and partly to the relative ease in admission as well as good prospects for the commerce degree. While engineering, medicine and technology have generally better prospects, admissions are very difficult and the courses are quite expensive and lengthy. Commerce courses are not very difficult or expensive and do not require any special aptitude or ability. Admissions are easily available and prospects are quite good in relation to the cost, effort and duration of the course, thanks to the five year plans which have raised the demand for commerce graduates.

But with the rapid increase in the number of commerce colleges and students, several problems have come up, shortage of competent teachers, of suitable buildings and of sufficient library facilities etc.,—which have become rather serious mainly due to the enormous rise in prices and cost of living. Consequently the quality of teaching and standards of education in general have declined. These must be raised and brought in line with the changing ideas as well as the requirements of a developing economy. This would naturally reflect in increased costs of education, both overall as well as per student, requiring an improvement in the supply of finance. It is in this context that the following analysis of the cost of education in commerce colleges of Bombay should be interesting and useful.

The Table at the end of this paper gives the main items of expenditure for the last 5 years as also some other significant figures. It is important to note here that these are *average figures* which naturally vary from the actual figures for each college. The table indicates that the number of commerce colleges has gone up from 6 to 8 during the last 5 years and the average number of students per college has gone down from 960 to 782. This decline in the number of students per college is to be welcomed provided the total number of students is fairly equally distributed over a larger number of colleges. But in actual practice it is found that the older colleges with better facilities and reputation continue to get a larger number of students, while some of the newer colleges are short of the required number. This is indicated by the range of students per college, which is as wide as 197 to 1,288 and which indicates that there was not sufficient scope for all the new colleges that have come up. It is rather interesting and significant that a new college is able to attract a relatively large number of students merely because of its location at the centre of business and employment, which assists many students to earn and learn.

The main items of college expenditure are teachers' salaries, furniture and library, rent, scholarships and miscellaneous items. Teachers' salaries form by far the most important item of expenditure, accounting for about 40% to 50% of the total cost. This is much less than the estimate (of 67%) made by the Education Commission for the country as a whole. The size of this expenditure is related to the number of teachers, the composition of teachers and the salaries as well as other emoluments paid to different categories of teachers.

The number of teachers in a college depends on the number of students, the size of classrooms, the number of subjects taught and the hours of work put in by a teacher. From the figures given, it can be seen that the average number of students per college has varied between 960 and 782 during the last five years while the average number of teachers has remained at 29. The teacher-student ratio has therefore declined from 1 : 33 to 1 : 25. This ratio has however been still smaller in some colleges and some years, not necessarily because of a deliberate effort but because of their inability to attract a sufficiently large number of students. This might be due to the young age of the college, its limited reputation, unfavourable location or poor university results in the previous years. There is yet another factor that has to be taken into account here. Every commerce college has quite a few part-time teachers with professional experience. The teacher-students ratio in a commerce college therefore has a slightly different significance.

Secondly, the number of teachers required will vary with the size of the classrooms. There was a time when classes of 160/170 students were not uncommon and the teacher could not even stand the physical strain; he had to be provided with a microphone. There has of course been some improvement in recent years but most classes even to-day consist of 100–120 students; this number should be brought down.

Similarly the larger the number of subjects taught at the college, the larger has to be the number of teachers. A choice is usually available to a college only in regard to the optional subjects especially at the B.Com. stage. Here again, the subject of Advanced Accounting and Auditing absorbs such a vast majority of students that just a few students are left for other subjects. It is therefore uneconomic and unnecessary that every college should provide for teaching of all optional subjects. In fact there could be a proper distribution of the optional subjects (other than accountancy) among all the colleges so as to reduce costs and also to encourage specialization.

Hours of work put in by each teacher have an important bearing on the number of teachers required. It is usual to have 3 lectures per subject per week plus some tutorials the number of which depends on the requirements of the subject as well as the availability of tutors. In the past, 20–25 periods per week was quite common. Such heavy workload plus some extra curricular work as well as examination work would naturally leave very little time and energy for the teacher's reading, research etc. Fortunately things have improved of late and the University itself prescribes ceilings in this behalf. Thus the maximum workload is—15 lectures or 19 periods (including tutorials). These are themselves very heavy and need to be reduced partly by increasing the number of teachers and partly by reducing the number of lectures for which there is some scope.

Pay scales, dearness allowance, retiring benefits etc., form a very important factor influencing the total cost on account of teachers. It can be seen from the figures that this cost has increased to some extent (about 10%) only in 1965–66 and 1966–67. It is significant that in 1965–66 even in a metropolitan and expensive city like Bombay, the average annual emoluments per teacher were about Rs. 4,500 as compared to Rs. 4,000 estimated for the country as a whole by the Education Commission.

There has been no doubt an improvement in the teachers' salary scales, dearness allowance etc., and individual colleges are required to conform to the regulations of the University which not only prescribes the scales, allowances etc., payable to different categories of teachers but also the number of professor's posts and the qualifications required for each category of teachers. The present position in this connection is as follows:

Salary Scales

1. Principal	Rs. 600–25–800
2. Professor	Rs. 350–20–450–25–650

3. Lecturer Rs. 250–15–400–20–500
4. Tutor Rs. 200–5–250–10–300

plus D.A. at rates paid by the Maharashta Government from time to time.

Experience has however shown that these salaries have not enabled colleges either to retain some of the best teachers or to attract to the teaching profession at least a few of the brilliant young men and women. It is good to learn that the University has decided to improve the grades as under:

1. *Principal*
    - *a.* Rs. 800–50–1,250
    - *b.* Rs. 700–40–1,100
2. *Professor*
    - Rs. 700–40–1,100
3. *Lecturer*
    - *a.* Rs. 400–30–640–40–800
    - *b.* Rs. 300–25–600
4. *Tutor*
    - Rs. 250–15–400

plus D.A. at rates paid by the Maharashtra Government from time to time.

There has been one notable effect of the improvement of emoluments of teachers in private colleges as compared to those in Government Colleges. Some teachers who were Lecturers or Assistant Lecturers in Government Colleges and who could not get promotion in good time have moved out to private colleges where they enjoy better status, emoluments as well as freedom.

The next item of expenditure is furniture, library, etc. This is a figure which varies widely from college to college and year to year. It is to be expected that in the first year of the establishment of a college, the expenditure furniture, library, etc., is very large but it goes on declining in subsequent years. It is unfortunate that separate figures for an important item like library are not available but one is happy to note that the University as well as commerce colleges of Bombay have established a convention according to which each college spends on library a non-recurring amount of about Rs. 15,000 in the first year and a recurring amount of about Rs. 10,000 per year thereafter.

Rent for the college building and Principal's quarters is an important item of expenditure, which accounts for about Rs. 45,000–60,000 per year. It may be noted here that although the college building (in the case of a Private College) is usually owned by the Society which runs the college, rent as fixed by Government engineers is charged to the annual expenditure. While each college appears to have generally provided sufficient space for lecture rooms, library, etc., teachers in some colleges need to have separate rooms/cubicles for their own personal work and solving the difficulties of individual students.

The amount spent on scholarships has varied between Rs. 13,647 and Rs. 26,086 per year. Except for 1963–64 the amount was about Rs. 13,000. This is rather small for an average number of about 800–1,000 students. It is necessary that at least about 10% of students of each college should get, on the basis of merit and need, about Rs. 250 per year by way of scholarships, freeships etc.

Miscellaneous expenditure which accounts for a very large amount, about 40% of the total annual cost, includes various items such as emoluments of non-teaching staff, postage, telephone, electricity, printing and stationery and expenditure on extra-curricular activities such as sports, college magazine and social and cultural programmes etc.

The aggregate of all these items of expenditure varied between Rs. 2·46 lakhs and Rs. 3·42 lakhs per college, so that the total cost per student works out to Rs. 316, Rs. 307, Rs. 298, Rs. 333 and Rs. 433 during the last 5 years. It is rather interesting that this average total cost per student for 1965–66 comes quite close to the figure of Rs. 328 as worked out by the Education Commission for the whole country. The increase from Rs. 333 in 1965–66 to Rs. 433 in 1966–67 is mainly due to the higher teacher costs. But this figure of Rs. 433 is not strictly comparable with the previous figures because the average for 1966–67 is worked out only for 3 colleges for which figures were available. It may be noted here that unlike the total cost per student, the teacher cost per student has increased year after year, from Rs. 124 in 1962–63 to Rs. 176 in 1966–67.

It may also be noted here that the increase in the cost per student would have been higher but for the running of morning/evening classes by some colleges in some years, which helped them to utilize their resources more intensively and spread their costs over a larger number of students. Whether the conducting of morning/evening classes mainly for employed students is or is not academically or otherwise desirable has been a subject of controversy in Bombay and several other parts of the country. Decisions on this question have been taken and reversed, from time to time, depending on the thinking of the majority of the policy-makers at a point of time. Some colleges are running morning/evening classes for non-degree courses, such as certificate and diploma courses for employed students. There is of course some additional expenditure involved in this type of instruction but it would be just marginal, so that the overall cost per student would go down.

The facts and figures mentioned above indicate that commerce colleges in Bombay have been moving in the right direction but slowly. The average number of students per college has gone down so that the teacher-students ratio has become more favourable, the number of teachers remaining constant. The teacher cost, both total as well as per teacher, has been increasing to give a better deal to teachers. Rent paid has been more or less constant at about Rs. 45,000–50,000 per year, while the amount spent on scholarships has declined. The teacher cost as well as the total cost per student has risen between 1962–63 and 1966–67, from Rs. 124 to Rs. 176 and Rs. 316 to Rs. 433 respectively. The University of Bombay is helping the colleges to maintain standards.

It is necessary to increase the pace of progress and to improve educational standards. In the light of past experience and with a view to meeting the future needs, one may suggest that a commerce college in Bombay should not have more than 1,000 students, not more than 80 students in each classroom and not less than 50 teachers. This would give a teacher-student ratio of 1 : 20 which should not be allowed to increase; it should be gradually reduced to the extent possible. Of the 50 teachers, at least 10 should be Professors, 20 Lecturers and 20 Tutors, with an average monthly emoluments of Rs. 900, Rs. 650 and Rs. 400 each and maximum work of 10, 12 and 15 lectures/periods a week for the respective categories. At least about 100 (10% of) students should get scholarship/freeship of Rs. 250 each per year. Sufficient money also needs to be spent on library facilities and extra-curricular activities. The following may then be the broad items of annual expenditure of a college:

	Rs.
1. Teachers' Salaries, etc.	3,60,000
2. Rent for buildings	60,000
3. Library books, furniture, etc.	15,000
4. Scholarships, freeships, etc.	25,000
5. Miscellaneous expenses for administrative staff, students' activities, postage, telephone, stationery, etc.	64,000
TOTAL	5,24,000

Out of this Rs. 5·24 lakhs of annual total expenditure, Rs. 3·5 lakhs (about 70%) should be raised from fees from students and the remaining Rs. 1·74 lakhs (about 30%) from grants from the State Government, U.G.C. and/or donors. The fees will go up to Rs. 350 per student per year as against Rs. 300 per year paid at present. Parents should not mind paying the slightly higher fees partly in view of the improved education and partly of the larger scholarships/freeships available to deserving and needy students. Similarly the State Government should not for the same reasons mind raising the grant amount by liberalizing if necessary the present formula, viz., 50% of the deficit plus 10% of the total expenditure. The University Grants Commission and private donors will make their own contribution. With such a better deal to teachers and improved facilities to students, standards of education in commerce colleges of Bombay should rise and remain high.

COST OF EDUCATION IN COMMERCE COLLEGES OF BOMBAY
1962-63– 1966-67

	1962-63	1963-64	1964-65	1965-66	196-67*
1. Number of Colleges	6	7	8	8	3
2. Number of Students per College	960	868	824	782	788
3. Number of Teachers per College	29	29	29	29	23
4 Number of Students per Teacher	33	29	27	25	34
5. Teaching Staff Salaries, etc. per College	1,19,400	1,20,141	1,16,700	1,32,627	1,39,013
6. Salaries, etc., per Teacher per Year	4,024	4,023	4,002	4,553	6,049
7. Furniture, Library, etc., per College	25,820	18,955	23,512	12,830	8,430
8. Rent per College	44,143	45,949	46,938	50,263	59,786
9. Scholarships per College	17,913	26,086	13,647	13,994	8,633
10. Miscellaneous per College	1,01,464	61,140	50,753	57,070	45,336
11. Total Expenses per College	3,04,219	2,66,796	2,46,199	2,58,398	3,41,778
12. Teacher Cost per Student	124	138	141	169	176
13. Total Cost per Student	316	307	298	333	433

*Based on figures for 3 colleges only.

Section II

Measurement of Efficiency in Education

Papers presented in this section clarify conceptual and empirical issues involved in judging internal efficiency of investment in educational institutional facilities. In this connection, A. R. Kamat's paper *Efficiency in Education* clarifies that while applying efficiency criteria of investment in education, a clear distinction should be made between the facilities that an institution provides and the output that an institution produces. He suggests important variables, like size of teaching staff, capital equipment, hostel facilities etc., for judging the quality of educational facilities, whereas for judging the quality of output he mainly concentrates on academic performance and extra academic performance of the students produced by an institution.

Laxminarayan Sinha, points out in his paper, *Costs and Efficiency of Education*, the importance of judging the efficiency of investment in the educational sector, particularly, with reference to a welfare state. However, he feels that while defining education as an investment good, a definition of the standard unit of output of education industry presents some conceptual difficulty. He tries to present a model which does not use marginal productivity theory. The contribution of education in the output of the two sectors incorporated in his model is shown in terms of rise in the efficiency of labour employed in each sector. His model does not involve the imputations of the existing wage structures back to the productivity of education.

J. H. Adhavaryu in his paper *A Theory of Investment in Human Capital* suggests the introduction of a policy oriented concept of costs in the field of education. Therefore, he recommends that only government expenditure should be studied in depth and private cost may be ignored. He rules out the possibility of application of rates of return approach for judging the efficiency of investment in Indian education. As an alternative, he suggests that the economic efficiency approach should be used in investment planning for education. He further classifies efficiency into two parts: 'internal efficiency' and 'external efficiency' of education.

D. Hajela and B. D. Tikkiwal in their joint paper *Wastage in Education and Measures to Prevent It* present an objective method of measuring the internal efficiency of education. They also refer to possible causes of wastage in education.

Q. U. Khan's paper *Efficiency Co-efficients for School Stage Education* evolves a method for measuring the expenditure on financing of wastage in school stage education for a period of ten years *i.e.*, 1955–65. Physical and monetary aspects of wastage have been quantified. Exercises, thus completed show that a considerable amount of money at school stage of Indian education is a waste from the point of view of society as a whole.

Two papers on *Functional Efficiency* were presented by the scientists from the Central Building Research Institute, Roorki.

R. D. Srivastav in his paper *Costs Reduction in Primary School Buildings* presents alternative models of school building evolved by the CBRI after a considerable amount of research in the functional efficiency of utilization of school building in the Indian context. He claims for the possibility of a 40 per cent reduction in the construction costs of school building by accepting any one of the schemes suggested in the paper. He mentions that his different schemes of construction of school buildings take into account the structure of curriculum. The second paper, *Lighting of Teaching Spaces* by V. Narasimhan and B. K. Sexena deals with lighting of teaching spaces. They suggest integrating lighting of teaching spaces with the overall planning for school building in the country.

Chapter Ten

Efficiency of Education

A. R. KAMAT

Clarification of Concepts

This short paper discusses some of the problems which arise when one considers the measurement of efficiency in education. It is an attempt at sorting out of ideas and it is hoped that it does not turn out to be a mere repetition of other similar attempts.

To start with it is desirable to clarify the concept of efficiency as used in relation to education. The concept of efficiency can be, and is found to be, used in several contexts in education. We shall mention here the following four to illustrate the different meanings with which it can be used in education.

i. Efficiency of the total national effort (or expenditure) on education, as an alternative to other welfare or non-welfare activities;
ii. Efficiency of the allocation of a given national budget on education over its different parts or sub-heads, such as primary education, secondary education and so on;
iii. Efficiency of expenditure over a sub-head of education such as higher education or over a group of institutions or over a single institution providing such education measured in terms of the educational facilities made available from that expenditure; and
iv. Efficiency of expenditure in situation (iii), but here, measured in terms of the actual output, that is, the trained people, produced in that situation.

It will be observed that the basic idea involved in all the four contexts mentioned above is that of the maximization of the use of facilities proivded or the output turned out, for a given amount of expenditure or of the minimization of the amount of expenditure required for providing a given set of facilities or producing a pre-determined output. For this purpose it should be possible to measure the different aspects of the facilities provided or the output produced and (preferably) to combine the different measurements into a single measure or index. It is here that most of the difficulties arise. The concept of ' returns to education ' is in fact an attempt by the economists to transform the output into a measurable characteristic regarding the expenditure involved as investment in this 'production process'. Although it is doubtful whether the returns quantified by the average earnings of persons trained at various levels exhaust all or even most of the characteristics of the training received, the procedure is understandable as a preliminary approach by the economists towards the problems of measurement indicated above.

The discussion now in this paper will be confined to situations (iii) and (iv) listed above, taking for illustration a single institution of higher education (say, a college) as a unit whose efficiency it is desired to measure. The two situations will be described respectively as that of maximizing the *facilities* for education provided from a given amount of expenditure and that of maximizing the *product* of education turned out for a given amount of expenditure. The problems therefore consist of the measurement of the quantity and quality of the educational facilities provided by an institution and the measurement of the quantity and quality of the educational product, that is, the persons trained by the institution. They will sometimes (loosely) be referred to below as the *quality* of the educational institutions and its *efficiency* respectively.

MEASUREMENT OF THE QUALITY OF EDUCATION (OR EDUCATIONAL FACILITIES)

A number of characteristics or variables are relevant for determining the educational quality of an institution, that is, for forming a measure of the educational facilities provided by it. For instance, for a collegiate institution they may be enumerated as follows:

i. Number of students, or size for which facilities are provided (along with its main divisions *e.g.*, arts and science students, pass and honours students, under-graduates and post-graduates, etc.).
ii. Size of the teaching staff or student-teacher ratio.
iii. Capital equipment including buildings, equipment, laboratories, library facilities, etc.
iv. Hostel facilities, proportion of the students who live in hostels.
v. Facilities for extra-curricular activities such as gymkhana and sports facilities, N.C.C., different college societies, etc.

Let us briefly consider the variates listed above before further variates are added to them. It should be observed that most of them can be given quantitative measures and in the case of some of them other related or auxiliary variates may also become relevant. For instance along with the total number of students in the institutions its broad division into arts and science students, pass and honours students, undergraduate and post-graduate students, etc., also becomes relevant. Similarly along with the size of the teaching staff an index of their qualifications, that is their quality, is also a very important characteristic. The variate (iii) may be measured by the present value of the capital equipment per student. One may measure the library facilities by the number of volumes per student and by the accommodation of the reading hall. And in the case of facilities for extra-curricular activities [variate (v)] one may either measure it by the per capita expenditure or the proportion of students who are benefited by each one of these activities.

There are two other problems which need to be considered in this connection. Firstly in considering the size of the institution, should one measure it by the actual number of students served by it at the moment or by the (maximum possible) number it can serve with the given facilities? It is true that in most of the older institutions the actual would approximate to the potential but in the case of the newer ones this may not be so and the distinction made above assumes some importance. Secondly, should one introduce a sixth variable (along with the five listed above), the annual operating cost per student? On the one hand such a variate may seem either redundant or not meritting inclusion as what one is dealing with is the problem of constructing a measure of the educational facilities rather than its cost. On the other hand there may be many 'other characteristics' of the quality of the educational institution in addition to those which are listed above (or which will be listed below); and the per capita expenditure may serve as a substitute in the absence of their composite index. This question evidently needs further careful exploration.

It is clear that the quality of the educational facilities provided by an institution may be considerably influenced by characteristics other than those listed above, and which moreover may not easily lend themselves to measurement. Such, for instance are the following:

vi. Type of administration.
vii. General atmosphere.
viii. Tradition.

It is evident that the quality of educational facilities available in an institution does depend on the type of administration. But it is a cause rather than the result and one is not quite sure whether one is justified in including it among the educational facilities which are in the nature of results. Moreover this variate is hardly capable of being measured except by means of a subjective score. The same difficulty of measurement also holds for the other two characteristics listed above. Along with 'Tradition' it may be desirable to introduce another auxiliary variable, namely a variable which depends on the age of the institution. This can be made measurable although the age in years may not be the most suitable measure. Finally we may introduce the residual variate.

ix. Other characteristics.

This has been considered above to some extent, but which as mentioned above needs further exploration.

MEASUREMENT OF THE EFFICIENCY OF EDUCATION (THE EDUCATIONAL PRODUCT)

Let us now consider the problem of measurement of the educational product produced by the institution, the measurement of the quality and quantity of training imparted by it to its alumni. The characteristics to be noted here may be grouped under four broad heads, the first two of which are obviously: (i) Academic performance, and (ii) Extra-academic performance while in the institution. In characteristic (i) the relevant variates are the percentage of passes together with the proportion of first and second classes (or of honours students) and a score constructed for combining other academic distinctions, such as, scholarships and prizes won at the university examinations by the alumni of the institution. Since the academic performance at any stage depends both on the previous level of equipment of the student as well as the training he receives in the institution, an allowance will have to be made for the former (by using, if necessary, the regression technique). Among the extra-academic achievements included under (ii), one has to take into account the distinctions obtained while in college in sports and games, in drama and debating, in the sphere of art, in social or public service and such other distinctions which can be attributed to the institutional influences, which can be either directly or even remotely traceable to the facilities provided by the institution or to its tradition and general atmosphere. A quantitative index to denote extra-academic performance is no doubt difficult but may not be impossible to construct.

The two sets of variates mentioned above do not exhaust the character of the imparted educational training, some effects of which may mature only in later life. Hence, it is necessary to introduce another set of variates which may be described as: (iii) Performance in later life. The measurement of this group of variates poses several problems. It is obvious that it must take into account the distinctions achieved by the alumni in later life, as scientists, litterateurs, artists, businessmen, public leaders, etc., as well as their entry into higher echelons of public services including defence services. Construction of an index which will include all these achievements is not easy. But perhaps even more formidable are two other problems in this connection. Firstly, this performance in later life will naturally imply a specified period of observation. The longer this period the greater is the opportunity for the unfolding of the latent influences acquired during the years spent in the institution. On the other hand with a longer period this index will not reflect the quality of the educational product in the recent past but during a much earlier period. Moreover, it will give an unwarranted weightage to the older institutions over the more recent ones whose alumni had no such chance to shine in life simply because they are still in the developing stage. Secondly, the approach mentioned above will only account for the performance of the relatively more outstanding individuals while the performance of the large majority of the alumni in later life will go by default. Perhaps it is to meet these and similar other problems that the economists seek the measure of returns to education, based on the average earnings of individuals who have reached different levels of training. A moment's reflection will show that a pure monetary measure like this may not be a good measure of the academic quality of the product in a society where an average businessman may earn a lot more than an outstanding author or a self-less trade union leader. So the problem needs further examination.

Finally one has to introduce the fourth characteristic (iv) The residual effect (of acquisition of general culture), since education is something more than the (measurable or more or less measurable) performances mentioned above. It is clear, however, that the measurement of the residual effect poses problems similar to those posed by the characteristics, tradition and general atmosphere, mentioned above when we considered the measurement of the quality of educational facilities provided by an institution.

METHOD OF ANALYSIS

After quantitative measures are given to the variables enumerated earlier in this paper, it is not difficult to construct a composite measure of the educational facilities provided by an institution or of the training it imparted to its alumni, by using appropriate statistical methods in multivariate analysis. One may proceed either by combining all the variables in one particular set of variables into a composite index for that set and then combine the indices of all the different sets of variables, or one may take them all together to build up the final index straightway since a modern electronic computer can easily handle a large number of component variables simultaneously. For the characteristics the use of zero-one method of quantification may become necessary. In fact in a preliminary investigation one should include all possible relevant variates. As the experience of handling such problems accumulates it will be possible to weed out and ignore those variates whose contribution to the final index is negligible.

Once such an index is constructed for the educational facilities provided or for the quality and quantity of the persons trained it is not difficult to relate it to the expenditure incurred and thus to measure the efficiency in the sense variates (iii) or (iv) referred to earlier in this paper.

In an empirical investigation the investigator has to be careful to avoid the mistakes which may render his analysis of doubtful value. For instance, if one is constructing a linear measure for an index, the number of observations on which it is based must not be very small; everybody knows that small-sample estimates tend to have large variation (if the variation in fact comes out to be small one should have a second look at the conceptual framework as well as the sample to see whether some obvious flaws have crept in). Secondly, if the observations are in the form of a time-series, all variates are likely to have very high mutual correlations in a period of an all-round growth or recession. These high correlations do not necessarily indicate an intrinsically close relationship between the variates. Then again one is likely to mix up characteristics which measure the educational facilities with those which measure the educational output with the result that one does not know what one is measuring.

It is at once conceded that the two schemes outlined above are not the only ones that can be devised.[1] But the point is, one has to examine carefully mutual relationships of the variates selected for measuring the composite character one has in mind.

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[1] It is also possible to speak about the efficiency of education by relating the quantity and quality of the product turned out by an institution to the educational facilities it has provided, treating the latter as given. In this sense the efficiency will mean the maximum utilization of the available facilities. The methodology becomes more complicated but is not essentially different since the problems of measurement are the same as those discussed in the above article.

A Note on Returns to Investment in Indian Education

Kamat and others have raised a number of issues regarding the measurement of returns to investment in education. Therefore, it is decided to give in a short note some of the major findings of three investigations carried out in connection with returns to investment in Indian education. These are: (*a*) a case study by Harberger, (*b*) research investigation by Nalla Gounden, and (*c*) the book on unemployment among educated persons by Blaug, Layard and Woodhall.

Harberger estimated rates of return to matriculation and higher levels of education on the basis of a survey of 5,885 male workers in Hyderabad in 1956. The income data derived from the survey were not classified by age and education of workers. Hence, he made several assumptions about the behaviour of life-time income profiles of educated persons. He consciously tried to bias the assumptions in order to produce higher rates of return to education. He assumed, for example, peak earnings occur relatively early in life, between age of 30 and 40, and the ratio between the peak and average earning was between 1·1 and 1·2. He also assumed that all income-differentials were due to educational-differentials. His findings are given in the Table.

Nalla Gounden made a detailed study of average and marginal rates of return to different types and levels of education on the basis of age-income-education data of 4,650 males living in urban areas in 1960-61 and income data of engineers supplied by the Council of Scientific and Industrial Research. He assumed 50 per cent of earnings was due to non-educational income determining factors. He estimated rates of return from the point of view of an individual and that from the point of view of the society as a whole. Main findings of his study are given in the Table, side by side with those of Harberger.

Recently, Blaug *et al* utilised the NCAER data and CSIR income data for 4,000 engineers. They gave three sets of estimates by assuming 50 per cent, 65 per cent and 100 per cent of income differentials were due to educational differences. In the Table we give the returns to education derived on the basis of their medium assumption.

SOCIAL RATES OF RETURN TO EDUCATION IN INDIA

Level	*Harberger*	*Nalla Gounden*	*Blaug*
0	1	2	3
Engineering diploma/Mat.	...	...	11·3*
Graduate—Post Graduate degree/Mat.	16·9	...	...
Engineering degree/Mat.	...	9·8	12·5
First degree (B.A. & B.Sc.)/Mat.	...	7·0	8·9
Matriculation/middle	11·9	10·2	10·5
Middle/primary	...	11·8	14·2
Primary/illiterate	...	16·8	15·2

* Calculated from machine tools industry data.

The principal aim of calculating rates of return to education is to compare the profitability of education with other forms of investment. Harberger estimated the marginal productivity of physical capital equipment between 17·2 per cent and 26·1 per cent and inferred that physical capital was highly productive in the industrial sector of the Indian economy. Nalla Gounden emphasised the redistribution of investable resources from education to rest of the economy. Blaug estimated social time preference rate for Indian economy was of the order of 12·5 per cent for alternative channels of investment as compared to education. All these studies indicate that Indian education is over-expanded from the social point of view but these rates of return do not take into account non-pecuniary and non-economic returns to education. Therefore, future investigations have to take into account the ignored and neglected aspects of benefits of education for purposes of resource allocation.[1]

—EDITOR.

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[1] A. C. Harberger, 'Investment in men versus investment in machines: The case of India' in *Education and Economic Development*; A. M. Nalla Gounden, 'Investment in Education in India', *Journal of Human Resources*, summer, 1967, pp. 347-358; M. Blaug, P. R. G. Layard and M. Woodhall, *The causes of educated unemployment: The Indian case*, London, Allen Lane, The Penguin Press, forthcoming, 1969. Also see, H. N. Pandit, "Economic Approaches to Investment Decision-making in Education", *Indian Educational Review* Vol. 5, No. 1, 1970, pp. 1-54.

Chapter Eleven

Cost and Efficiency of Education

LAKSMINARAYAN SINHA

Educated manpower is as important for economic development as efficient accumulation of physical capital. Trained workers can make the best possible use of the resources available. They can develop the available resources rapidly. The advantages of education are not, however, confined to the men who man the machines. Education creates a general climate for mental and moral improvement. It inculcates in its consumers refined taste and rational behaviour in regard to consumption and saving. It induces in workers a sense of responsibility and zeal for continuous improvement in their performance. In economics education has, therefore, been given the importance it deserves right from the ancient beginnings of the science. Kautilya devotes to education the four opening chapters (after the introductory one) in the *Arthasastra* (c. 300 B.C.), the first great work in welfare economics. Adam Smith also gives it importance in his work.[1]

Human element is nowwhere more important than in education. Cost is, therefore, nowhere else more elusive. A savant or saint may educate people through his social influence more effectively than institutions spending crores of rupees. In an institution itself one teacher may, through his professional efficiency and moral stature, impart more education, in real value terms, than a number of his colleagues together do and yet he may be getting the same salary as any one of his colleagues. Education is a mission. Its highest performance is founded on self-denial. The brahmans in ancient India, it is said kept teaching as their main work, denied to themselves both wealth and power. We have to bear these things in our mind when we evaluate cost of education in terms of materials. Like that of other services, cost of education has to be calculated in terms of wages and salaries paid and other expenses incurred. Allowance has, however, to be made for the personal element which escapes such calculation. We have to be conscious of the limitations of our cost calculus.

Education improves the quality of labour available for employment. For any measurement, theoretical or practical, differences in quality of labour have to be reduced to equivalent differences in quantity so that each unit (quantity) of labour receives the same wage. An hour's work by an engineer may, thus, be equivalent to, say, 10 man-hours' labour by an average unskilled worker. Quantity equivalence of a given skill structure can be obtained from the existing wage structure or from a social norm adopted for efficient incomes policy and manpower planning. A civil servant's one man-hour may be equal to 30 man-hours of an average unskilled worker on the basis of differences in existing wages. According to the social norm adopted it may, however, be equal to say, only 3 man-hours of an average worker. A social norm can be the basis of calculation only when the Government has decided to pursue an income policy consistent with that norm. In any other case differences in skill have to be evaluated in terms of existing wage differences.

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[1] *Wealth of Nations*, Vol. II, London, 1947, pp. 269-70.

Contribution of various educational institutions can now be calculated in terms of homogeneous labour units. A secondary school, for example, may contribute 200 labour units in a year if it turns out in that year 100 matriculates, each of whom commands in the market double the wage rate of an average unskilled worker. Products of the school need not be homogeneous. Suppose only 40 of them can command double the average wage rate; the rest can earn only the average wage rate and a half; then output of the school is 170 labour units ($40\times2+60\times1{\cdot}5 = 170$ units). Drop-outs can also be accounted for. If a particular drop-out can earn more than the average wage rate, he should be evaluated accordingly; the additional labour units represented by him should be added to the output of the institution; if he earns just the average wage rate he does not add to the output and resources spent over his education are a waste; if he develops certain complexes and physical characteristics as a result of his education so that he is only able to earn even less than the average wage rate, he has to be evaluated accordingly and output of the institution has to be adjusted to the negative value it has created. Products of different institutions of the same grade (primary, secondary etc.) need not be exactly similar. If 100 matriculates of one school are equivalent to 170 labour units, 100 matriculates of another school need not be equivalent to as many labour units; they may be equal to more or less than 170 units. Products of each institution have to be evaluated separately.

Cost of education may be divided into institutional cost and personal cost. Institutional cost consists of the materials contributed by the institution under reference as well as by other institutions (including the Central, State and local bodies). Personal cost consists of the materials contributed by students or their guardians. Earnings foregone by students are also part of personal cost for those families which are actually deprived of such earnings. Even small children assist some families in particular occupations such as crop-sharing tenants in fertile agricultural tracts. Opportunity cost of education of various grades (primary, secondary etc.) impinges upon different income groups differently. For well-to-do parents and for society generally the disutility of keeping children uneducated (or less educated) is greater than any opportunity cost of educating them. The materials contributed by both the sources, institutional and personal, can be valued in constant rupee.

Cost of education may, again be divided into three parts: fixed capital, circulating capital and wages. These goods which may be used for more than one year can be treated as fixed capital. Those goods which are used up during one year are circulating capital. Wages are, in fact part of circulating capital, but these may be accounted for separately for convenience.

An educational institution employs teachers, clerks, peons, cooks, servants and others. It pays them wages at different rates. Services of these employees have, again, to be converted into homogeneous units (man-hours) so that the wage rate for each unit is the same. This has to be done on the basis of the existing wage structure in the economy. The wage cost can, thus, be represented as the average wage rate multiplied by the quantity (man-hours) of labour employed.

Students of an educational institution are also workers engaged in production. The quality and intensity of their work have a significant part in determining quality and quantity of output. Resources spent over maintenance of students have also to be treated as wages. Since students or their guardians have to meet whole or part of their maintenance cost, these may be treated as negative wages. Students are potential labour for the economy. They are primary labour units. The negative wages they contribute anticipate the positive wages they would earn in future. The maintenance cost of students can, thus, be calculated in terms of the average rate and represented by the number of wage units so calculated, multiplied by the number of homogeneous labour units into which the number of students is reduced on basis of the quality of (education etc.) students at the time of their enrolment and the normal working hours in the economy generally.

Cost of fixed capital can be calculated in terms of difference in its value at the beginning and at the end of the year under study. Fixed capital may be treated as a joint product along with the labour units turned out. In view of the difficulties in ascertaining its current market price, one-year old fixed capital can be evaluated in terms of its historical cost (original cost with allowance for annual depreciation quota).

We may now put the cost calculus in the form of a model. Let there be j educational institutions ($j = 1, 2, \ldots\ldots, J$) of different types and grades. We denote fixed capital by K and circulating capital by X.

Let us have i number ($i = 1, 2, \ldots\ldots, H$) of fixed and circulating capital employed in j institutions so that these are denoted by K_{ij} and X_{ij}. Fixed capital items may be denoted as $K^{\circ}{}_{ij}$ when they are new, by $K'{}_{ij}$ when they are one year old and so on. Let $p^{\circ}{}_i$, $p'{}_i$ etc., be price of fixed capital items in different years of their life and p_i, price of circulating capital items. L_j is the number of labour units employed in j institutions and w is the wage per unit of labour. $\bar{L}_j$ is the number of labour units equivalent to the number of students engaged in these institutions and λ_j is the number of wage units in which this maintenance cost is measured so that $\lambda_j \bar{L}_j w$ represents total maintenance cost. We denote by 1_j the number of labour units turned out by these educational institutions in a year. Let ϵ_j be the rate of return of labour units turned out (1_j) over potential labour input (L_j). The model then takes the form[2]:

$$K^{\circ}{}_{ij}p^{\circ}{}_i + X_{ij}p_i + L_j w + (1+\epsilon_j)\lambda_j L_j w = 1_j w + K'{}_{ij}p'{}_i$$

$$i = 1, 2, \ldots\ldots, H$$

$$j = 1, 2, \ldots\ldots, J$$

$$\text{or } K^{\circ}{}_{ij}p^{\circ}{}_i - K'{}_{ij}p'{}_i + X_{ij}p_i + L_j w + (1+\epsilon_j)\lambda_j L_j w = 1_j w$$

We may find the difference in the value of fixed capital between the beginning and end of a year in terms of the annual depreciation quota. Let t be the life of fixed capital and r the current rate of profit. We assume the fixed capital to have constant efficiency throughout its life.

$K'{}_{ij}p'{}_i$ is then equal to $K^{\circ}{}_{ij}p^{\circ}{}_i \left[1 - \frac{r\{(1+r)t'^{+1} - (t+r)^t\}}{(1+r)^t + 1} \right]$

The equation above can be put into the form[3]:

$$K^{\circ}{}_{ij}p^{\circ}{}_i \left[1 - \frac{r\{(1+r)^t - (1+r)\}}{(1+r)^t - 1} \right] + X_{ij}p_i + L_j w + (1+\epsilon_j)\lambda_j \bar{L}_j w = 1_j w$$

In the model above ϵ_j indicates average efficiency of the various educational institutions.

To calculate marginal efficiency of investment in education we have to consider the period over which products of educational institutions will have their earnings. The earning period is also adjusted to the rate of mortality relevant to the professional groups or income groups of the products. Let ${}^{n}{}_j$ be the effective earning period (number of years) of the products of various educational institutions. Let e_j be the marginal efficiency of investment. We attribute salary increments etc., during the service period to on-the-job experiences and training. Then e_j is determined from the following:

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[2] The model can also be put into matrix form: $A^{\circ}P^{\circ} - A'P' + XP + Lw + (1+\epsilon_j)_j Lw = B$ where $a^{\circ}{}_{ij} = k_{ij} a'{}_{ij} = K'{}_{ij}$, X has the vectors X_{ij} P has P_i vectors, L has I_i, L has I_j and B has b_j vectors ($b_j = 1_j$) in the original equation.

[3] If the fixed capital be t' years old at the beginning of the year under reference the first term of the equation would be $K^{\circ}{}_{ij}p^{\circ}{}_i \left[1 - \frac{r\{(1+r)^t - (1+r)^{t'} - (1+r)^{t+1} + (1+r)\}}{(1+r)^t - 1} \right]$

$$K^{\circ}_{ij}p^{\circ}_{i}\left[1-\frac{r\{(1+r)^{t}-(1+r)\}}{(1+r)^{t}-1}\right]+X_{ij}p_{i}+L_{j}w+\lambda_{j}\bar{L}_{j}w=l_{j}w\left[\frac{1}{1+e_{j}}+\frac{1}{(1+e_{j})^{2}}+\ldots+\frac{1}{(1+e_{j})^{n}j}\right]$$

If salary increments etc., during the service period are also included in prospective yields of pre-employment formal education, the equation for determination of e_j will take the form:

$$K^{\circ}_{ij}p^{\circ i}\left[1-\frac{r\{(1+r)^{t}-(1+r)\}}{(1+r)^{t}-1}\right]+X_{ij}p_{i}+L_{j}w+\lambda_{j}\bar{L}_{j}w=\frac{(l_{j}w)_{1}}{1+e_{j}}+\frac{(l_{j}w)_{2}}{(1+e_{j})^{2}}+\ldots+\frac{(l_{j}w)_{nj}}{(1+e_{j})^{nj}}$$

Marginal efficiency, e_j, may be the criterion for allocation of resources between different institutions. It may also be used as basis for distribution of inevitable resources between education and other branches of the economy. Yet efficiency of education, as derived from the existing wage structure, may not be consistent with the social demand for investment in education. It is this discrepancy which emphasizes the need for adoption of a social norm in evaluating the contribution of various educational institutions. If an adequate social norm is adopted for evaluation, it will cover the social demand for investment in education. Efficiency calculated on the basis of such social norm will be sufficient criterion for investment in education in relation to other lines of production. As already indicated, a rational incomes policy is a necessary concomitant of a social norm adopted for calculation of cost and efficiency of education.

Chapter Twelve

The Theory of Investment in Human Capital

J. H. ADHVARYU

The original concept of factors of production only regarded capital as the produced means of production, the rest of the three factors being used in their basic forms. However, in the course of time the critics of the law of diminishing returns found exception with the Ricardian thesis of 'original and indestructible qualities of soil'. Land in order to be more productive had to be improved and when the improved piece of land yielded something more than what it did before in its unimproved form, clearly the additional reward could not be attributed to land but to the investment made for improving the land. The improvement so to say had to be 'produced' in no less a sense than the one implied in the production of capital.

While this concept of investment in land improvement with the consequent addition to production came to be accepted much earlier than Marshall, it could not become an accepted concept explaining the improvement in the productivity of the human factor. Labour continued to be treated as a basic unprocessed factor collaborating with other factors in the process of production.[1]

However, with the technological advance in productive processes, labour in its simple crude form could not prove adequate to operate the complex mechanical contrivances. Human factor now could not be lumped together as labour. Apart from the categorization of labour as 'skilled' and 'unskilled', human factor participating in production has several categories which are themselves the 'products' of an earlier process of training and education applied to them.

Human resources have to be processed in order to render them more productive, or (if viewed in the context of modern technology) productive at all just as natural resources are processed. A metallurgist or an engineer is as good a piece of capital as a machine turned out from iron ore.

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[1] It may be pointed out here that the classical economists were not unmindful of the capital value in the educated and trained human beings. However, this element of investment in man was not brought by them in the main stream of economic discussion, as a contributory growth factor. B. F. Kiker, 'The Concept of Human Capital in the History of Economic Thought', *Indian Economic Journal*, Jan.-March, 1967, pp 467-486.

Expenditure on education is not merely a part of welfare expenditure on the part of the State and a sort of cultural compulsion on the part of individuals. It is a sort of investment expenditure also. Once, the educational expenditure is regarded as investment, the debate spreads over a wider area. For, if educational expenditure is an investment expenditure it should fulfil all the theoretical attributes of investment. That is, it should be capable of yielding returns at a certain rate as all other investments do and its value therefore should be determinable.

Value of Investment in Human Capital

What expenditure should constitute the investment in human capital? In a free enterprise economy where education constitutes one of the social services and the expenditure on which is shared between the citizens and the State, it is essential to distinguish the two types of expenditure, for otherwise, as will be pointed out later in this paper, the determination of the returns in terms of investment will become difficult.

The possible expenditure which can be easily ascertained is that constituting of both public and private outlays. However, some economists may include even the loss of earnings suffered by the students in terms of the lost opportunities for jobs.[2]

Some economists may go to the extent of including among costs the money value of the efforts of mothers to impart pre-school education and the education given by religious authorities.[3] To the list may be added the loss of revenue the State exchequer may suffer due to either exemption or concession in tax payments granted to educational institutions. If the definition of schooling is made wide enough one can include expenditure positively made or earnings foregone during the period of training, orientation and refresher courses in the total factor costs on education.

If all these costs are summed up the total can be divided into two broad categories viz., costs borne by the student and costs not borne by the students.

While proliferating the list of costs may be a good intellectual exercise for the economists, such calculations are bound to loose precision and to verge on mere approximations as they may be based on imprecise and unauthentic information. No doubt the economist may be able to point out a slice of outlay here and there by stretching his vision in search of costs, such calculations may be much useful for the formulation of a State policy of education.

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[2] See T. W. Schultz, 'Capital Formation by Education', *Journal of Political Economy*, Dec. 1960, pp. 579-80. Also *The Economic Value of Education*, Columbia University Press, New York, 1963, p. 29. According to Schultz estimates of costs constituted by earnings foregone are as high as 60 per cent of the total costs in the U.S. both at the College and High School.

[3] See for such a view Fritz Machlup, *The Production and Distribution of Knowledge in the U.S.*, Princeton University Press, 1962, p. 103.

A Policy-Oriented Concept

What is germane to the whole problem of educational investment is to select a concept of costs which may provide guidelines for the framing of a public policy. Viewed thus the cost of education should be construed as public costs incurred by Government in all its ramifications for education, training and orientation.

Though it is true that a larger part of the total factor costs is accounted for by costs borne by the students, it is proper that private costs are ignored especially for the purpose of calculating the returns.

The above contention is based on the following considerations.

Firstly, private educational expenditure is based on the expectation of a larger share of the national income irrespective of its effect on its increase or otherwise. It may not be, so to say, planned with a view to helping the increase in national product. The estimates of return to educational expenditure construed as the sum of increase in the differential incomes incidental to education will be misleading from the social point of view. It may not show any net addition to the national product incidental to educational expenditure.

Secondly, the investment component of private expenditure cannot be determined, for, a large part of it constitutes only 'consumption' expenditure[4], incurred for the purpose of satisfying the cultural requirements of affluent families.[5]

Thirdly, the attempt to include foregone earnings in costs, as per Schultz's contention, will unduly inflate them. This will be especially so in the case of underdeveloped countries where alternative opportunities for gainful employment are much limited. Again, the children of well-to-do parents may not have any opportunity cost of education for they are not under a pressing need for employment.

Earnings foregone, if included in the costs, will pervert the concept of national income. National income constitutes *measurable* flows of the economy while earnings foregone can be only *notional*. If such notional earnings are to be added to educational costs, they should also be taken into account in connection with other unpaid and voluntary work such as that of housewives, mothers etc.[6]

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[4] It may be argued here that even the public educational outlays may not *in toto* constitute investment and there may be large part of it accounted for by welfare expenditure. However, construed broadly, all welfare expenditure, including that on health, constitutes, investment in human resources, Ritchie Calder, 'Utilization of Human Resources' *Manpower Journal*, *IAMR* New Delhi, Vol. I, pp. 148-168.

[5] The huge expenditure made by affluent parents for educating their daughters in India and elsewhere may not have any relevance to social product. On this ground huge sums spent by way of private tuitions cannot be treated as investment expenditure even on private account.

Fourthly, the prevalent earnings differentiate in favour of the educated people do not reflect their differential contribution to social product. They reflect largely long established social conventions in an inherently imperfect labour market.[7]

And fifthly, that in an economy wherein there is a calculated effort made by public authorities to allocate resources, taking into account the resources available and the alternative investment needs to be satisfied, it is in the fitness of things that public outlays are only considered for assessing the efficiency of investment in education.[8]

Return to Investment in Human Capital

Next to determining the nature of the value of investment, the theory of investment in human capital has to determine the nature of return to such investment in human capital. Economists have attempted to ascertain the return to educational outlays by means of two approaches viz., direct and indirect. The direct approach is based on the calculation of the rate of return to investment in education in terms of the growth rate of the economy traceable to educational expenditure, while the indirect one consists in ascertaining the efficiency of educational outlays in providing the requisite quantity and quality of manpower for economic growth.

The Rate of Return Approach

The rate of return approach carries much appeal to reason. For, it immediately places the expenditure on education in the class of investment. This approach again can have two aspects, one dealing with the over-all contribution of educational expenditure of GNP and the other with the differential incomes of individual incidental to advanced education and training and thereby establishing the contribution of education to the growth of national income.

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[6] John Vaizey, *Economics of Education*, Faber and Faber, London, 1962, p. 43. It may be noted that as national income estimates do not take into account goods and services deemed to have been produced by the unemployed, so also the earnings foregone need not be comprehended as cost of education.

[7] T. Balogh and P. P. Streeten, 'The coefficient of Ignorance' *Bulletin of the Oxford University Institute of Economics and Statistics*, May, 1963, p. 102. 'Expenditure on education is highly correlated to income and wealth of parents, to ability and motivation, to educational opportunities such as urban residence, to access to well-paid jobs through family and other connections, any of which could either by itself or in conjunction with any of the others, account for superior earnings.'

[8] Such an approach can be helpful for an educational policy oriented towards the manpower supply needs of a growing economy.

The calculation of the contribution to GNP may be made by deducting the part of the increase of GNP attributable to the measurable inputs of capital and labour from the total increase and thus accounting for the residue as the contribution of improvement in the labour inputs as a result of education and training.[9]

The rates of return to the individuals or private expenditure are calculated by calculating the differential earnings of the educated and trained after allowing some credit for the age levels of the income earners.[10]

The worthwhileness of return-to-investment approach for ascertaining the contribution of education to economic growth depends on the validity of the assumptions on which the calculations are based. The rate of return therefore will vary according to the assumed items of educational expenditure. As has been pointed out earlier, such calculations will open the flood-gates of approximations and may thus be able to provide nothing substantial beyond a computational exercise.

In fact the rate of return to investment in education does not disclose to us whether education is a sufficient or necessary condition of growth. It may, if at all it can, provide us with some guidance as to the allocation of resources amongst the competing investments for growth. Assuming that educational investment contributes nothing or very little to GNP should educational expenditure be stopped from rising? If the public expenditure can be stopped, can the private one be stopped in order to divert the private resources so saved to alternative investment channels ?

If the estimates of the contribution of education to GNP are beset with so many pitfalls, the estimates of individual income differentials attributable to education are more so. Here the great factor rendering such estimates questionable is the imperfection of the market for manpower. The higher earnings attributable to education may contain a large element of rent based on the scarcity of parents who can afford to educate their children well and overcome the restrictions of membership of a profession in which existing members may have a financial interest in maintaining artificial scarcity.[11]

Wages and salaries and also the professional fees are administered prices and hence they do not reflect the marginal productivities of the income recipients.

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[9] See for this approach Robert M. Solow, 'Technical Change and Aggregate Production Function', *Review of Economics and Statistics*, August, 1957, pp. 312-330 and E. F. Denison, 'Education, Economic Growth and Gaps in Information', *Journal of Political Economy* (Supplement) Oct., 1962, pp. 124-28.

[10] G. S. Becker 'Underinvestment in College Education'? *American Economic Review* (Papers and Proceedings), Vol. 50, No. 2, May, 1960.

[11] T. Balogh and P. P. Streeten *Op. cit.*, pp. 101-102. In India the limited members of successful candidates in examinations of professional associations may be indicative of such interest.

Beyond conveying that there is some investment element in educational expenditure which is significant to growth, the rate of return approach does not provide conclusions immediately applicable to policy. It no doubt satisfies well the economists' mania for quantifications based on, at times, irrelevant and invalid assumptions.[12]

Again, it may be that investment in education may not be the cause but in fact the effect of the size of GNP. A highly industrialized country with a high per capita GNP can well extend the learning age of its young population while a poor country like India simply cannot achieve universalization of even primary education over a long period.[13] Investment in education in such a context is not the cause but only the effect of high GNP.

From the foregoing discussion it can be concluded that while a search for a precise rate of return to educational expenditure may prove a wild goose chase, it is not even so indispensable to policy for planning educational outlays. For this purpose one has to ascertain the economic efficiency of expenditure on education. Such an approach is not only a convenient hypothesis but an indispensable guideline for planning educational outlays at various levels.

The Economic Efficiency Approach

The economic efficiency approach in a way is a micro approach in the sense that it does not study the returns to education from the point of view of over-all growth. It studies whether the educational outlays fulfil the economic objectives of a growing economy in terms of the required quantity and quality of manpower.

Viewed thus, the efficiency criterion can have two important aspects, (1) internal efficiency of the educational system, and (2) its external efficiency.

Internal Efficiency

Internal efficiency refers to the simple intake and out-turn of pupils and students. It, therefore, deals with, so to say, possible waste in the educational system owing to drop-outs and stagnation in the system at various levels.

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[12] It may be pointed out here that the comparative studies of differential earnings may be helpful for other purposes of social policy. It is therefore essential that the decennial censuses in India may collect informations regarding earnings as corresponding to the level of education and age.

[13] International comparison of the correlation of school enrolment ratios and GNP is made for OECD countries by I. Svennilson, Friedrich Edding and Lionel Elvin in '*Policy Conference on Economic Growth and Investment in Education*', Vol. II, OECD, Paris, January, 1962.

It may also refer to problems of capacity of utilization in the educational system so that for a given amount of overhead outlays on buildings, staff and equipments, the optimum number of students can be determined. In short, it deals with the productivity of the educational system.

The efficiency of the system can be studied either in an over-all way, *i.e.*, referring to all the levels of education or with reference to its particular levels, such as, primary, secondary and higher.

In the case of India, as for example, it has been pointed out that though during the post-independence period of thirteen years from 1948–49 to 1960–61 educational outputs have grown more than two and a half times, the educational outlay has grown nearly four times in real terms.[14] This may clearly indicate that our educational system is inefficient.

Given such a correlation between expenditure and output, one can set further to find out the week points in the system. The most important factor contributing to internal inefficiency is drop-outs and repeats.[15] While this may not be eliminated by making suitable changes in intake or by adjusting outlays it is nevertheless a pointer to the waste in our educational system. There is one other factor viz., excess capacity which has lowered down the efficiency of expenditure on education.

In educational planning especially in a scarcity-ridden economy, the most efficient use of the educational facilities, such as buildings, libraries, equipment, etc., should be the guiding principle. In the case of India it is found that in several universities the number of students is very small.[16] Not only that but in certain departments of the universities the number of students is very small. This leads to less than optimum utilization of educational facilities.

It is here that per student cost becomes so important in the theory of investment in education from the point of view of internal efficiency. A norm should be laid down regarding per student cost.[17] Or, in the alternative there should be a minimum number of students on average per department. The UGC can provide this norm to be observed by the universities. This would considerably mitigate the inefficiency incidental to excess capacity.[18]

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[14] P. R. Panchmukhi, 'Measurement of Educational Output', *Indian Economic Journal*, Conference Number 1965, pp. 82-83. Panchmukhi has worked out the index of efficiency of educational expenditure which, as he has indicated, declined by 34 per cent in 1960-61 (1948-49=100). Panchmukhi, however, has not indicated the components of expenditure.

[15] See *Education in India*, Ministry of Education, New Delhi, Vol. I, 1962, pp. 299-300.

[16] See *U.G.C. Report*, 1964, pp. 45-46.

[17] The British University Grants Committee is not in favour of inter-university or international comparison of costs per student, for, it is contended that, such comparisons often do not compare like with like. However, such comparisons are like inter-firm comparisons and can go a long way in pointing out the spots of waste in educational expenditure. C. F. Carter, 'The Economics of Higher Education'. *The Manchester School of Economic and Social Studies*, January, 1965, p. 1. In India the Education Commission has made inter-university cost comparison. However, what is needed is a uniform method of cost calculations in the absence of which comparison between like cannot be secured.

External Efficiency

In a growing economy the educational system should answer the needs of the economy for manpower both in terms of quantity and quality. The external efficiency of the system depends on how efficiently it meets these needs. External efficiency thus can have two aspects, quantitative one and qualitative one.

The quantitative external efficiency rests on how efficiently the system is able to supply the quantitative needs for manpower such as, engineers, doctors, technicians, economists, etc. Thus the quantitative aspect will provide a guideline for determining the intake capacity especially in different faculties and branches of knowledge. If it is that the system is unable to meet the need of the economy for engineers, more resources should be diverted to engineering education either from other sectors of the economy or from other tiers of the system.

For example, in the case of the Indian educational system it is sometimes argued that the programme of compulsory primary education involves tremendous waste. For, if from the primary tier, the pupils do not migrate to the secondary and there from to the higher levels the educational expenditure yields much less by way of supply of high-level manpower.[19]

From the point of view of purely economic objectives of educational expenditure as opposed to its social ones, one can say that the educational system in India involves a tremendous amount of wastage and the quantitative criterion of efficiency would suggest diversion of funds from the primary tier to the secondary and higher ones.

The Quantitative Aspect of External Efficiency

The qualitative aspect of the external efficiency of the educational system would deal with the problem whether the manpower released by the educational system satisfies the specific requirements of the jobs it is intended to perform in the economy. It may be that the system is able to meet the quantitative needs of the economy but the candidates may not be able to answer successfully the requirement of certain placements for a specific type of knowledge and skill. Such a situation would indicate the need for a change in the structure and content of education.

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[18] This aspect of internal efficiency has been well stressed in the educational planning in OECD countries. The OECD countries have largely depended on the economic efficiency approach in their educational plans. Direct return-to-education approach has not found much favour in OECD working arrangements. See for this, Louis Emmerij, 'Economic Objectives of Education: Reflections on the OECD Experiences' *Manpower Journal, IAMR,* April-June, 1967, pp. 79-91.

[19] See for such a contention Neil Mcinnes, 'The Economics of Indian Education—The Bugbear of Literacy' '*Capital* (Supplement to) 22 December, 1960, pp. 11-15. This view may be partly correct. However, in a country like India educational expenditure cannot be completely deprived of its welfare content.

This point can also be well illustrated from the experience in India. In India there is a general tendency that the number of applications are in excess of the number of vacancies advertized. However, from amongst the applicants called for interview (who also are called in a number exceeding that of vacancies) it becomes difficult to secure suitable candidates in the strength adequate enough to fill the vacancies.

For example, during the Third Plan, it is found, that Maharashtra State Public Service Commission could not recommend an adequate number of candidates possessing technological, engineering and other qualifications. Thus the candidates recommended were only 14·28 per cent of the vacancies in the case of technologists, 65·22 per cent of the vacancies in the case of agricultural experts, 69·23 per cent in the case of engineers. It may be noted that against twenty-one vacancies offered, in technology the number of applicants was twenty-nine.[20]

Thus while the internal efficiency of the educational system relates to what happens within the system, the external efficiency links it with the quantitative and qualitative manpower needs of the economic system. Both together can provide quite dependable guidelines for educational planning.

Conclusion

The theory of investment in human capital, though of quite recent origin, has no doubt made a significant contribution to the economic theory in general. However, the efforts of economists to measure the contribution of investment in man to the over-all growth of the economy in terms of a certain rate may fail to provide the planners reliable indicators to plan educational outlays. This is not because such attempts are all hypothesis, but because, in the absence of reliable data, they are subject to wide margins of error. As a result, their utility for educational planning is much diminished. That is why, while recognizing the economic significance of such calculations, Robbins Committee on Higher Education in Britain did not rely on them for policy recommendations.[21]

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[20] 'Utilization Pattern of Educated Persons in Maharashtra State During Third Plan,' *Manpower Journal, IAMR*, April-June, 1967, p. 126. The study was made by the Manpower Wing, Planning Division, Finance Department of the Government of Maharashtra.

[21] Report, p. 71.

While it may not be possible to derive the exact rate of return to investment in education, efforts of such quantifying economists have served a useful purpose by pointing out the need for collecting reliable statistical material on the educational, occupational and age structures of the employed manpower and their correlations. Despite this it will not be possible to eliminate fully the element of approximations from the estimates of rate of return. Though in totalitarian economies such calculations may be very close to the correct figure, in free enterprise economies, they will incline more towards imprecision.[22]

The economist therefore has to seek another approach for ascertaining the contribution of investment in man to the social product. This approach does not relate the investment in man to the aggregate national product. It links such investment with the output of the system itself in which the investment is made. The economist here is on a firmer ground and can well emerge with conclusions which may be useful for policy.

Such an approach, which is based on the assessment of the economic efficiency of investment in man, may prove useful for an under-developed country like India, where there is not much deficiency in the collection and compilation of reliable data and where, again, some of the concepts of cost (such as opportunity cost) are not applicable.

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[22] Despite this there are some economists who defend quite vehemently, the rate-of-return approach. But then they have to seek shelter behind an appeal to a sense of propriety rather than to cogent logic. See M. Blaug, 'Rate of Return on Education in Great Britain', *The Manchester School of Economics and Social Studies*, September, 1965, pp. 250-51, for such a defence of the rate-of-return approach.

Chapter Thirteen

Wastage in Education and Measures to Prevent it

D. HAJELA and B. D. TIKKIWAL

Measurement of Wastage in Education

On the one hand, due to paucity of resources, we have not been able to provide proper education facilities to our people; on the other, we have been wasting our resources in various ways. There is need for measuring this wastage in some way and then take steps to reduce it. The examination results, no doubt, give some idea of this wastage, but it is not so scientific as the one that is given below.

Various measures of wastage have been suggested in some of the recent studies. A latest study on this subject has been carried out by Rao and Tikkiwal.[1] Tikkiwal and Rao visualize the wastage in a given course of education as consisting of three components (i) wastage for the course due to stagnation; (ii) wastage for the course due to drops; and (iii) wastage due to the non-utilization of training.

To have some idea of these three components, let us assume that there are N students admitted in a given course of education and we observe the performance of these students upto p ($>d$) years, d being the duration of the course. During these p years, some of the N students will pass the course with or without stagnation for some years, whereas others will drop out at one stage or the other. If p is sufficiently large, then only a few students may remain at the end of the pth year who do not pass the course till then. For purposes of analysis, we may assume that these students drop out of the course at the pth year. The students, who drop out of the course without completing it, give rise to the wastage due to drops. The students, who complete the course with some years of failures, give rise to the wastage due to stagnation. The students, who after completing the course either do not utilize the training or are not able to utilize the training, give rise to the third component of wastage.

The investigation carried out by Rao and Tikkiwal gives quantitative measurements of these three types of wastage and illustrates these measurements with the help of a case study. We omit here the details of the statistical formulae, but reproduce the details of the case study from Section 4, p. 235 of their paper.

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[1] G. Nageswara Rao and B. D. Tikkiwal, 'An integrated approach to the study of wastage in a given course of education'. *Sankhya Series B*. Vol. 28, Parts 3 and 4, pp. 229-236, 1966.

Case Study

We present below the data on a batch of 47 students admitted in the year 1959–60 in Economics M.A. (Previous) in the Department of Economics, University of Rajasthan, to have a picture of wastage. The data give information regarding all the students till they had left the Department without completing the M.A. (Final) up to the end of the academic year 1962–63. It further gives information regarding whether or not the students took up appropriate jobs after completing their M.A. This information was obtained by following up the students who had passed the examination till the end of the academic year 1963–64.

Description of the Data. 47 students were admitted in M.A. (Previous) Economics in 1959–60. Their performance during the above specified period in the Department was as follows:

i. 38 students passed M.A. in the prescribed minimum period of two years.
ii. 2 students, one male and one female, passed M.A. in three years. The male student took a drop in Previous Examination and agin joined Previous and completed the Final Examination in 1962. The female student passed M.A. (Previous) in 1960 and did not join the Department later. She passed her M.A. (Final) in 1962 as an ex-student.
iii. 6 students left within the first year of their joining the Department. One left in the month of September 1959, three in the month of November 1959, one in January 1960 and one February 1960.
iv. 1 student left the Department in February 1961 after passing the previous in 1960.
v. 19 students, out of 40, who had passed joined professions suitable to their training or continued their studies.
vi. 4 students joined professions where the minimum qualification laid down was lower than their qualification but higher qualification was preferred.
vii. 12 persons joined professions which were not suitable to their training.
viii. 5 persons could not and did not join in any profession whatsoever.

In this case study, the wastage due to stagnation was 2·30%, the wastage due to drops was 5·86% and the third component of wastage due to non-utilization of training was 39·40%.

It is clear that the first two components of wastage are negligible as compared to the third component. Possibly a similar situation prevails in many other post-graduate courses, and in some technical courses, particularly Engineering these days. However, we are likely to come across a different situation for under-graduate courses where the first two components of wastage may be significantly higher than the third component. However, for definiteness such studies should be conducted for all important courses of study over a certain period.

It may be noted, in passing, that the latest method of the authors (Rao and Tikkiwal) makes it possible to study the three components of wastage by observing only a small fraction, say 10%, of students studying a particular course and thus the method would effect considerable economy in such studies when adopted.

The Causes of Wastage and the Measures to Prevent them

The causes of wastage are well known. However, we list them for the sake of completeness: (i) The financial allocation to education has been proportionately low. Education had received low priority in our planning so far. Only now in the Fourth Plan we intend to give very high priority to education. (ii) There seems to have been no sound criteria for opening new universities with the result that many more universities were opened than our resources warranted. (iii) Within the universities, there has been quantitative expansion, in terms of number of departments, rather than a qualitative one with the result that the resources at the disposal of a given University have not been utilized in an optimum manner. The Departments are opened all over the country without ensuring proper staff, proper space, proper funds etc., resulting in a good deal of inefficiency. (iv) There has been a change in the medium of instruction at most of the universities. As a result of which we have a very high percentage (*e.g.*, about 65% in the University of Rajasthan during the last eight years) of failures at PUC and I Yr. T.D.C. examinations every year (for details see Appendix I). There is need for ensuring proper training in the medium of instruction say within six months of college education unlike the present procedure of instruction in languages for a period of two years. (v) The need for proper syllabi which allow students sufficient time for self-reading and writing. (vi) Examination reforms.

Though, the first two causes are not within the jurisdiction of a given university; but the rest certainly are. If we want to have proper expansion of a given university, we need educational planning within the university. Though there has been some planning in each university in as much as each university has to submit its five yearly plan to the U.G.C. for consideration. But our own impressions are that there has been no sound planning. For example in our own University (Rajasthan) we have always felt shortage of accommodation and other basic amenities to our teachers, but it has not been possible to meet these requirements in spite of the best efforts of our authorities. This is probably because we expanded in the past, in quantitative terms, much more than our resources permitted. Thus, in order to have sound planning, it is necessary to have a planning and research cell within each university.

This cell should have among others an educationist, economist and a statistician with machinery to collect educational data on a scientific basis and to analyse them for laying down the educational policy of the university. With proper collection of data, this cell can also suggest ways and means for reforming our syllabi and examination system. To enforce this plea for such a cell we quote some sporadic studies pointing out how they have been helpful in focusing attention on our educational problems.

One such study conducted by Rao and Tikkiwal of the Department of Statistics, Rajasthan University, has already been mentioned. The study indicates that for the batch of 47 students admitted in the year 1959-60 in Economics M.A. in the Department of Economics of the above University, the only significant wastage was of the third type and was as high as 39·04 per cent. If this high degree of wastage is confirmed by subsequent studies, it will suggest the need for cutting down admissions to the extent of 20 to 30 per cent so as to reduce the wastage almost to zero. On the other hand, if we find that significant wastage in a given course is due to the first two components, this would then suggest either an increase in the resources for the course or a decrease in the number of admissions for the course, at least to the extent of 50% of the wastage.

A series of studies has been made at the University of Gauhati in Examination reform by Dr. H. J. Taylor, the Ex-Vice-Chancellor of the University of Gauhati and his associates. We summarize below some of the important findings of Dr. Taylor.

Dr. Taylor[2] points out that as a large number of question papers are to be set every year (40,000 approximately), it is difficult to find so many competent paper setters. Therefore, he suggests the following procedure.

'Setting a question paper is not a task to be undertaken lightly, and the job should not be assigned to 40,000 separate individuals, most of whom are unaware of its complexities. Some universities have a board of paper setters for each group of related papers. This is a better method, and should be still better if every board has at least one member with a knowledge of Statistics and familiarity with the modern trends of examination research. The work should not be hurried, and the first meeting of a board could well be devoted entirely to a discussion of the objectives to be aimed at and the general design of the papers. At the second meeting, drafts should be discussed and analysed, and referred back for modification. Only at the third meeting should the papers be finalized. The time and trouble involved would be well repaid by the improvement that would result in the standard of evaluation. Co-operation between Universities would be desirable, where by a board appointed by University A might prepare papers for University B. Apart from overcoming some problems this cooperation would probably react favourably on the standards of teaching in the universities.'

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[2] H. J. Taylor, 'The Question Paper', *Education Quarterly* No. 4, pp. 1-9, 1962.

Dr. Taylor[3] gives an experiment to find out the reliability of examination marking. For this, it was necessary to have scripts marked by more than one examiner. In this experiment double marking was carried out for all the candidates of one college at the pre-University examination of 1962 with some exceptions. There were 45 candidates, and the subjects involved were English (2 papers), Alternative English, Economics, History, Logic and Mathematics. In History, each script was valued by three examiners; in Assamees, Lusai and Geography, each script was valued by only one examiner due to the paucity of examiners in these subjects; in the rest of the subjects, each script was valued by two examiners. Three separate tabulations were made for these examinations, on the basis (i) that the lowest estimate of the true marks was accepted for each script; (ii) that the average estimate of the true marks was accepted for each script; (iii) that the highest estimate of the true marks was accepted for each script. The following table summarizes the results of the three tabulations:

TABLE 1

THE RESULT OF PRE-UNIVERSITY EXAMINATION, 1962 BASED ON THREE DIFFERENT ESTIMATES OF TRUE MARKS OF A SCRIPT

	Result based on lowest estimate	*Result based on average estimate*	*Result based on highest estimate*
I. Division	0	1	4
II. Division	3	4	5
III. Division	14	17	22
Failures	28	23	14
Pass percentage	38	49	69
Av. Total	222	242	260
			(Max. 600)

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[3] H. J. Taylor, 'An Examination of Examiners. A Study of the Reliability of the Examination Marking', *Journal of the University of Gauhati*, No. 2 science, pp. 1-13.

The above table indicates that there was considerable variation from examiner to examiner in marking a particular script. However, the average total marks for all the students, did not differ from one estimate to another very much, the difference between the lowest estimate and the highest being only 6%. This suggests that our requirement that a student must pass in each subject separately at PUC is not a sound requirement; as a student may be failed, in a given subject, by one examiner but may be passed by another. One simple suggestion, made by Dr. Taylor, is that a student should be passed on the basis of his minimum total for different subjects. But, if we want to retain passing in separate subjects, we should have some estimates of the variability, in marking, from examiner to examiner and also for the same examiner. For this, it may be noted that the experiment has to be designed in a manner different from that of Dr. Taylor. From the experiment of Dr. Taylor, it is not possible to measure the variability, in marking, for a particular examiner.

From the academic year 1965–66, the University of Rajasthan introduced the system of awarding 10 per cent of the total marks, in the post-graduate subjects, for the sessional work throughout an academic year. At a meeting of Professors and Heads, the Vice-Chancellor desired the Department of Statistics to examine statistically whether there had been some kind of non-uniformity in awarding sessional marks by different post-graduate institutions. For this purpose we selected only those subjects for study where the number of students were large. The different subjects chosen were taught at different institutions. The university was the only common institution for different subjects.

The Statistical analysis is given in Appendices II and III. The Appendix II gives the analysis for Economics, English and Political Science. The Appendix III gives the ranking of first 10 students (in the University as a whole and in its different Institutions separately) in the above 3 subjects on the basis of total marks and on the basis of marks obtained in the annual examination alone. The letters A, B, C and D in these appendices denote the four different affiliated institutions (Colleges) of the University.

It is clear from Appendix II that the average percentage difference between the sessional marks and the annual marks is higher in case of each of the institutions as expected. However, it is much more so in case of the affiliated institutions; showing thereby that the affiliated institutions which seem to have been very liberal in awarding sessional marks. In any case the higher percentage in sessional marks did not reflect in their performance at the annual examination as far as the affiliated institutions were concerned.

The ranking of first 10 candidates within each of the institutions and the University as a whole show that the higher percentage in sessional marks did not affect, by and large, the ranking of the students. We have not examined whether the divisions of different students were affected or not by giving higher percentage in sessional marks. Probably it did not. This seems to be due to the fact that there are only 40 marks for sessional marks, out of a total of 400, to be counted towards the annual examination.

From this study it is clear that efforts should be made, in each subject, to bring about uniformity in awarding sessional marks. But it may be difficult to bring this uniformity not because it is not academically possible but because there are human factors which appear to be unsurmountable under Indian conditions. Till this uniformity is achieved, it is not appropriate to raise the percentage of total marks for the sessional work. The University of Rajasthan plans to overcome the difficulty, from next academic year, in another way, viz., by mentioning the performance in the internal assessment separately in the certificate alongwith the performance in the annual examination. The internal assessment of a candidate will be based on his sessional work as well as on the tests prescribed for a particular subject.

The internal assessment is meant to meet the academic requirement that a student should be evaluated in a given subject on the basis of more than one examination. It is also meant to make the student more serious about his work. This objective can be met in some other ways as well. For example, we can divide the academic year in two approximately equal periods (Semesters) and then conduct examination at the end of each period. We may then continue to award 10% of total marks in each period towards sessional work in that period. Such alternatives are under study in this University.

The possibility of completely dispensing with the annual examination of the type where so many external examiners are appointed may be discarded, over a period, when the different institutions develop a uniformity in internal evaluation through constantly comparing their mutual evaluations in relation with the annual university evaluation. This can be possible only through regular statistical studies of the type given on page 151.

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APPENDIX I

TABLE 1

THE NUMBER OF CANDIDATES (FACULTY-WISE) AND THEIR PASS PERCENTAGES AT THE EXAMINATION IN PRE-UNIVERSITY COURSE (PUC) OF THE UNIVERSITY OF RAJASTHAN FOR THE YEARS 1960-1967

S. No.	*Faculty*	*Arts*			*Science*			*Commerce*		
	Years	*No. of students appeared*	*No. of students passed*	*Percentage*	*No. of students appeared*	*No. of students passed*	*Percentage*	*No. of students appeared*	*No. of students passed*	*Percentage*
0	1	2	3	4	5	6	7	8	9	10
1.	1960	2,756	937	36·0	2,142	646	31·6	1,657	525	33·0
2.	1961	4,032	1,411	35·1	3,092	984	31·8	2,409	806	33·5
3.	1962	4,493	1,735	38·4	3,507	1,375	38·6	2,464	1,029	41·1
4.	1963	3,997	1,727	43·2	2,850	963	33·8	2,229	819	36·7
5.	1964	3,275	1,181	36·0	2,561	931	36·3	1,676	591	35·3
6.	1965	3,714	1,423	38·3	2,280	824	36·0	1,771	793	44·6
7.	1966	5,460	1,654	30·0	2,485	678	27·3	1,825	700	38·3
8.	1967	3,439	1,213	35·3	2,011	759	37·7	1,594	614	38·5
TOTAL AND OVERALL PERCENTAGE		31,166	11,281	36·2	20,928	7,160	34·2	15,625	5,877	37·6

TABLE 2

THE NUMBER OF CANDIDATES (FACULTY-WISE) AND THEIR PASS PERCENTAGES AT THE EXAMINATION IN FIRST YEAR OF T.D.C. OF THE UNIVERSITY OF RAJASTHAN FOR THE YEARS 1960-1967

S. No.	*Faculty*	*Arts*			*Science*			*Commerce*		
	Years	*No. of students appeared*	*No. of students passed*	*Percentage*	*No. of students appeared*	*No. of students passed*	*Percentage*	*No. of students appeared*	*No. of students passed*	*Percentage*
0	1	2	3	4	5	6	7	8	9	10
1.	1960	369	149	41·5	492	144	30·3	193	61	32·1
2.	1961	1,794	501	42·4	1,357	588	43·2	895	404	45·1
3.	1962	3,265	1,063	32·5	2,208	726	32·9	1,582	595	37·3
4.	1963	4,595	1,946	42·3	2,801	1,067	38·0	2,021	882	43·6
5.	1964	5,837	2,623	44·9	3,405	1,288	37·8	2,218	1,146	51·2
6.	1965	4,980	2,147	43·0	3,134	1,024	32·7	1,967	742	40·2
7.	1966	6,599	2,683	41·0	4,314	1,592	37·9	2,477	1,046	41·8
8.	1967	7,651	3,090	40·4	4,988	1,711	34·3	2,800	1,030	36·8
TOTAL AND OVERALL PERCENTAGE		38,411	14,205	37·0	22,699	8,140	35·9	14,153	5,906	41·7

APPENDIX II

TABLE 3

AVERAGE PERCENTAGE OF MARKS OBTAINED, BY THE STUDENTS OF THE UNIVERSITY OF RAJASTHAN IN THREE DIFFERENT INSTITUTIONS, ON SESSIONAL WORK AND AT THE ANNUAL EXAMINATION (1966) IN ENGLISH

S. No.	*Name of the institution*	*Average percentage of marks on sessional work*	*Average percentage of marks at the annual examination*	*Difference of the two percentages*
0	1	2	3	4
1.	A	54·66	43·15	11·51
2.	C	61·82	39·95	21·87
3.	University Department	46·44	39·89	6·55

TABLE 4

AVERAGE PERCENTAGE OF MARKS OBTAINED, BY THE STUDENTS OF THE UNIVERSITY OF RAJASTHAN IN THREE DIFFERENT INSTITUTIONS, ON SESSIONAL WORK AND AT THE ANNUAL EXAMINATION IN 1966 IN POLITICAL SCIENCE

S. No.	*Name of the institution*	*Average percentage of marks on sessional work*	*Average percentage of marks at the annual examination*	*Difference of the two percentages*
0	1	2	3	4
1.	A	51·62	42·42	9·20
2.	B	62·78	37·22	25·56
3.	University Department	48·95	43·52	5·43

TABLE 5

AVERAGE PERCENTAGE OF MARKS OBTAINED, BY THE STUDENTS OF THE UNIVERSITY OF RAJASTHAN IN FOUR DIFFERENT INSTITUTIONS, ON SESSIONAL WORK AND AT THE ANNUAL EXAMINATION (1966) IN ECONOMICS

S. No.	*Name of the institution*	*Average percentage of marks on sessional work*	*Average percentage of marks at the annual examination*	*Difference of the two percentages*
0	1	2	3	4
1.	A	75·63	41·14	34·49
2.	C	59·37	34·39	24·98
3.	D	60·50	39·18	21·32
4.	University Department	55·65	46·25	9·40

APPENDIX III

TABLE 6

RANKING OF FIRST TEN STUDENTS FOR ENGLISH IN THE INSTITUTION A ACCORDING TO THE TOTAL MARKS AND ACCORDING TO THE MARKS OBTAINED BY THEM IN THE ANNUAL EXAMINATION

Students	*Ranks according to total marks*	*Ranks according to the annual examination marks*
1	2	3
1	1	1
2	2	3·5
3	3	3·5
4	4	2
5	5·5	5
6	5·5	6
7	7	7
8	8	8
9	9	10
10	10	9

TABLE 7

RANKING OF FIRST TEN STUDENTS FOR ENGLISH IN THE INSTITUTION C ACCORDING TO THE TOTAL MARKS AND ACCORDING TO THE MARKS OBTAINED BY THEM IN THE ANNUAL EXAMINATION

Students	*Ranks according to total marks*	*Ranks according to the annual examination marks*
1	2	3
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	10
10	10	9

TABLE 8

RANKING OF THE FIRST TEN STUDENTS FOR ENGLISH IN THE UNIVERSITY DEPARTMENT ACCORDING TO THE TOTAL MARKS AND ACCORDING TO THE MARKS OBTAINED BY THEM IN THE ANNUAL EXAMINATION

Students	*Rank according to total marks*	*Rank according to the annual examination marks*
1	2	3
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	9
9	9	8
10	10	10

TABLE 9

RANKING OF THE FIRST TEN STUDENTS FOR ENGLISH IN THE UNIVERSITY AS A WHOLE ACCORDING TO THE TOTAL MARKS AND ACCORDING TO THE MARKS OBTAINED BY THEM IN THE ANNUAL EXAMINATION

Students	*Rank according to total marks*	*Rank according to the annual examination marks*
1	2	3
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	9
9	9	8
10	10	10

TABLE 10

RANKING OF FIRST TEN STUDENTS FOR POLITICAL SCIENCE IN THE INSTITUTION A ACCORDING TO THE TOTAL MARKS AND ACCORDING TO THE MARKS OBTAINED BY THEM IN THE ANNUAL EXAMINATION

Students	*Rank according to total marks*	*Rank according to the annual examination marks*
1	2	3
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
10	10	10

TABLE 11

RANKING OF FIRST TEN STUDENTS FOR POLITICAL SCIENCE IN THE INSTITUTION B ACCORDING TO THE TOTAL MARKS AND ACCORDING TO THE MARKS OBTAINED BY THEM IN THE ANNUAL EXAMINATION

Students	*Rank according to total marks*	*Rank according to the annual examination marks*
1	2	3
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
10	10	10

TABLE 12

RANKING OF FIRST TEN STUDENTS FOR POLITICAL SCIENCE IN THE UNIVERSITY DEPARTMENT ACCORDING TO THE TOTAL MARKS AND ACCORDING TO THE MARKS OBTAINED BY THEM IN THE ANNUAL EXAMINATION

Students	*Rank according to total marks*	*Rank according to the annual examination marks*
1	2	3
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9·5	9
10	9·5	10

TABLE 13

RANKING OF FIRST TEN STUDENTS FOR POLITICAL SCIENCE IN THE UNIVERSITY AS A WHOLE ACCORDING TO THE TOTAL MARKS AND ACCORDING TO THE MARKS OBTAINED BY THEM IN THE ANNUAL EXAMINATION

Students	*Rank according to total marks*	*Rank according to the annual examinations marks*
1	2	3
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9·5	9
10	9·5	10

TABLE 14

RANKING OF FIRST TEN STUDENTS FOR ECONOMICS IN THE INSTITUTION A ACCORDING TO THE TOTAL MARKS AND ACCORDING TO THE MARKS OBTAINED BY THEM IN THE ANNUAL EXAMINATION

Students	*Rank according to total marks*	*Rank according to the annual examination*
1	2	3
1	1·5	1
2	1·5	2
3	3·5	3
4	3·5	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
10	10	10

TABLE 15

RANKING OF FIRST TEN STUDENTS FOR ECONOMICS IN THE INSTITUTION C ACCORDING TO THE TOTAL MARKS AND ACCORDING TO THE MARKS OBTAINED BY THEM IN THE ANNUAL EXAMINATION

Students	*Rank according to total marks*	*Rank according to the annual examination marks*
1	2	3
1	1	1
2	2	4
3	3	2
4	4	5
5	5	7
6	6	6
7	7	8
8	8	9
9	9	10
10	10	11

TABLE 16

RANKING OF FIRST TEN STUDENTS FOR ECONOMICS IN THE INSTITUTION D ACCORDING TO THE TOTAL MARKS AND ACCORDING TO THE MARKS OBTAINED BY THEM IN THE ANNUAL EXAMINATION

Students	*Rank according to total marks*	*Rank according to the annual examination marks*
1	2	3
1	1	1
2	2	2
3	3	3
4	4	5
5	5	4
6	6	6
7	7	7
8	8	8
9	9	9
10	10	10

TABLE 17

RANKING OF FIRST TEN STUDENTS FOR ECONOMICS IN THE UNIVERSITY DEPARTMENT ACCORDING TO THE TOTAL MARKS AND ACCORDING TO THE MARKS OBTAINED BY THEM IN THE ANNUAL EXAMINATION

Students	*Rank according to total marks*	*Rank according to the annual examination marks*
1	2	3
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	8
8	8	8
9	9	8
10	10	11

TABLE 18

RANKING OF FIRST TEN STUDENTS IN ECONOMICS IN THE UNIVERSITY AS A WHOLE ACCORDING TO THE TOTAL MARKS AND ACCORDING TO THE MARKS OBTAINED BY THEM IN THE ANNUAL EXAMINATION

Students	*Rank according to total marks*	*Rank according to the annual examination marks*
1	2	3
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9·5	9
10	9·5	10

Chapter Fourteen

Efficiency Coefficients for School Stage Education

Q. U. KHAN

Preliminary

Two efficiency coefficients for the General School Education System (GSE) have been worked out here to show the size of the total educational expenditure which goes into the financing of the 'educational wastage' of the system. The first coefficient is calculated in *physical terms* and the other coefficient is valued in *monetary terms*. However, we may caution here that the first one is based on the relative ratios of the conventionally published per-pupil costs[1] of primary, middle and high or higher secondary schools, while in the calculation of the second coefficient, the apportionment of the educational expenditure incurred on the entire GSE has been made by applying the estimated per-pupil costs of primary, middle and high or higher secondary *stages* of education. Both the coefficients show that a considerable proportion of the total educational expenditure goes in financing the wastage component of the GSE. In terms of 'physical coefficient' the educational costs of GSE due to 'educational wastage' were increased by 62 per cent and 50 per cent respectively in 1965. These percentages, when expressed in monetary terms on the basis of reclassified data, stood at only 43 and 36. However, both the coefficients indicate a decadal declining trend in 'educational wastage'.

The order of presentation set out in this paper is as follows: first of all the organizational pattern of the GSE which existed during 1955 to 1965, has been introduced. The subsequent steps relate to developing equations which facilitate in arriving at the efficiency coefficient in physical terms. After having done this, the apportionment of total direct educational expenditure among three stages of the GSE along with the methodology adopted for doing so, is presented and the efficiency coefficient in terms of money worked out. In the end various issues involved in the problem have been spelt out and it has been emphasized that to have a better picture through these two efficiency coefficients, refinements for these issues are inevitable.

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[1] The terms 'cost' and 'educational expenditure' have been used inter-changeably in this paper and both refer to 'direct educational expenditure' component of 'total education expenditure' only.

Organizational Pattern of the GSE System

The general school education system is of unequal length in different States (and even in different parts of some States). The system extends over 10 years in one part of India and 11 years in most of the other parts of the country. In certain parts of the country, however, it extends even over 12 years. But everywhere the system is divided into three stages, namely, primary, middle and high/higher secondary. Although there is considerable amount of non-uniformity in the number of years comprising each of these three stages yet for the purposes of this paper they are assumed to have the following uniform durations for the country as a whole:

Primary Stage—5 years; Middle Stage—3 years; and
High/Higher Secondary Stage—3 years.

Further, in establishing the cost per level or stage, it is proposed to express it in terms of the cost per primary stage pupil, say *Cp*[2]. The two years have been chosen to assess the progress of the proportion of the GSE system budget actually devoted to financing a ' full education '. In other words, what percentage of the total budget for GSE system was used to pay for an incomplete education in 1955 and how the position changed after a decade in 1965.

Cost Variations at the Different Stages

The costs of education at the high/higher secondary and middle stages, on an average, bore the following proportions to the cost of primary stage education in the two years under review:[3]

	1955	1965
a. High/higher secondary education cost to primary education cost	3·0 times	3·5 times
b. Middle stage education cost to primary education cost	2·0 times	1·5 times

Allowance for Drop-outs[4]

The phenomenon of drop-outs—withdrawal of pupils from school stage cycle—has been common to all the three stages of GSE although it varied in magnitude from stage to stage. To the extent the educational system suffers from drop-outs, the cost of education goes up and returns from educational expenditure diminish. The cost per graduated pupil is raised by the extent of drop-outs. The proportions by which the cost per graduated pupil increased due to drop-outs in the three stages of the GSE in 1955 and 1965, are given below:

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[2] See, Syloain Lourie, 'Education for Today or Yesterday', *Problems and Strategies of Educational Planning—Lessons from Latin America*, Institute for Economic and Social Development Studies, UNESCO, Paris, 1965.

[3] Figures are based on *Education in India*, Ministry of Education, 1955-56 for 1955 and *Report of the Education* Commission, 1964-66 for 1965.

[4] Calculations for drop-outs were made separately for three stages of the GSE by relating enrolment of the preceding class of each stage to the enrolment in the final class of the respective stage with appropriate time-lag.

S. No.	*Stage*	1955	1965
0	1	2	3
1.	Primary	0·72	0·47
2.	Middle	0·18	0·12
3.	High/Higher Secondary	0·21	0·15

Allowance for Stagnation

Another source of 'educational wastage' is the phenomenon of stagnation—the number of students staying in the same class for more than the prescribed period. Statistics showing the correct picture about the nature and extent of stagnation in the GSE system of India are not available. The Education Commission conducted a study in 29 districts out of 312 to have some idea of the extent of stagnation in classes I-VIII[5]. For each class, information was gathered on two points: total enroment and number of repeaters, classified according to the total period they had spent in the class. From this information, the average period spent by the pupils in the class was calculated and its excess over one year—which is the normal period—was described as the 'stagnation index' for the class in that year. These indices are given in the Report of the Education Commission separately for boys and girls[6]. After having given the relative weights of boy's and girl's enrolments, these indices have been worked out for total enrolment in individual classes, I-VIII. The stagnation indices for the other three classes viz., classes IX, X and XI, have been estimated. While the index of class VIII has been repeated for class IX, the indices for classes X and XI have been assumed as twice (separately for boys and girls) the stagnation index of class IX. This is so assumed because in both these classes there is a final school examination in which many students fail and repeat.

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[5] There are some other studies also on this subject but all of them are lacking in one respect or other. Mention may, however, be made of the following studies which throw some light on total wastage—drop-outs as well as stagnation, at the national level:

- i. *Wastage and Stagnation in School Education, A Pilot Study*, 1965, Asian Institute of Educational Planning and Administration, New Delhi.
- ii. *Wastage and Stagnation at the First Level of Education*, NCERT, New Delhi, 1967 (Mimeographed).
- iii. D. V. Chickermane, 'A Study of Wastage in Primary Education in India', *Education and Psychology Review*, Vol. 2, January 1962.

[6] *Report of the Education Commission*, 1964-66, p. 156.

Table 1 below gives the stagnation indices for the individual classes of three stages of the GSE system for the year 1965. In the absence of detailed and comprehensive information for the year 1955, similar calculations could not be attempted for that year. Compelled by the paucity of data, the 1965 stagnation indices have been assumed to hold good for 1955 also.

TABLE 1

ASSUMED STAGNATION INDICES FOR THE THREE STAGES OF GSE, 1955 AND 1965

S. No.	*Primary Stage*		*Middle Stage*		*High/Higher Secondary Stage*	
	Class	*Stagnation Index*	*Class*	*Stagnation Index*	*Class*	*Stagnation Index*
0	1	2	3	4	5	6
1.	I	43	VI	15	IX	14
2.	II	29	VII	15	X	27
3.	III	24	VIII	14	XI	27
4.	IV	23				
5.	V	19				

Proportional weights of enrolments in individual classes were applied to the stagnation indices given in Table 1 above to arrive at the stagnation effect on the cost per graduated pupil. It was found that stagnation increased the cost per graduated pupil in the three stages of the GSE in 1955 and 1965 by the following magnitudes:

S. No.	*Stage*	1955	1965
0	1	2	3
1.	Primary	0·53	0·46
2.	Middle	0·17	0·13
3.	High/Higher Secondary	0·25	0·25

Allowance for Total Educational Wastage

Total 'educational wastage' has been taken to include both 'drop-outs' and 'stagnation'. It may be seen that the total cost of education includes the cost of educational wastage. This cost of educational wastage is incidental and additional to the 'prime' cost which may be defined to represent the cost of an educational system which is free of educational wastage. The cost of education added up for the three stages of the GSE in 1955 took the following shape:

Primary Stage $= 1 + 0{\cdot}72 + 0{\cdot}53 = 2{\cdot}25$;
Middle Stage $= 1 + 0{\cdot}18 + 0{\cdot}17 = 1{\cdot}35$; and
High/Higher Secondary Stage $= 1 + 0{\cdot}21 + 0{\cdot}25 = 1{\cdot}46$

The total costs for the year 1965 were as follows :

Primary Stage $= 1 + 0{\cdot}47 + 0{\cdot}46 = 1{\cdot}93$;
Middle Stage $= 1 + 0{\cdot}12 + 0{\cdot}13 = 1{\cdot}25$; and
High/Higher Secondary Stage $= 1 + 0{\cdot}15 + 0{\cdot}25 = 1{\cdot}40$

Physical Efficiency Coefficient

If the educational wastage is assumed to be zero, the cost of the entire GSE system for the years 1955 and 1965, expressed in terms of the cost per primary stage pupil for 1955 can be given as follows:

$$\text{Similarly, for 1965}\quad \left.\begin{array}{ll} 5C_p + 3(2C_p) = 20C_p & (a) \\ 5C_p + 3(1.5C_p) = 20C_p & (b) \end{array}\right\} \text{I}$$

The total cost of the GSE in terms of the cost per primary stage pupil for both the years is same although the relative proportions of high/higher secondary education and middle stage education costs to primary stage cost have substantially altered during the two years.

Let us now introduce the wastage factor and see the extent by which the cost of education gets inflated in two years and also examine the relative position in these two years. The above results (I) take the following shape:

$$\left.\begin{array}{ll} 2{\cdot}25 \times 5C_p + 1{\cdot}35 \times 6C_p + 1{\cdot}46 \times 9C_p = 32{\cdot}49C_p & (c) \\ \text{Similarly, for 1965} & \\ 1{\cdot}93 \times 5C_p + 1{\cdot}25 \times 4{\cdot}5C_p + 1{\cdot}40 \times 10{\cdot}5C_p = 29{\cdot}97C_p & (d) \end{array}\right\} \text{II}$$

The effect of educational wastage can be found by substracting the first set of results from the second set of results for the two years under discussion. *It may be noted that in 1955 the complete GSE system cost 62% more than it would have cost if it had no educational wastage. It is gratifying to note, however, that this additional cost came down to only 50 per cent in 1965 that is to say an improvement of about 20 per cent over a decade.*

Allocation of Educational Expenditure

It is now proposed to introduce the monetary element and show what amount of the total 'direct educational expenditure' incurred on the GSE was actually devoted to finance the system net of educational wastage.[7] This can be done if either the distribution of the total direct educational expenditure or of the total budget of the GSE exists or an indication as to the respective shares claimed by the three stages of the GSE are available. In fact neither of these is available. It is a pity that the statistics on educational expenditure are cast only by type of institution. Even this classification by type of institution is not available for the entire educational expenditure incurred on the GSE. The 'indirect' expenditure is neither classified by type of institution nor by stage or level of education.

Under these circumstances, the allocation of total budget of the GSE has been restricted to the distribution of 'direct' expenditure and that too by making certain suitable assumptions in allocating the direct educational expenditure among the three stages of the GSE, the following methodology has been applied.

i. The primary stage enrolments have been assumed to be located in primary and middle schools only. (Some of the high or higher secondary schools also have primary classes attached to them but this has been taken to be practically insignificant. The per pupil cost of that portion of primary stage enrolment which is not located in primary schools has been taken to be the mean of per pupil costs of primary and middle schools. The entire direct educational expenditure of primary schools has been added to this figure to arrive at the figure of total direct educational expenditure incurred on primary stage education.

ii. The direct educational expenditure for the middle stage education has been arrived at by adding together (*a*) and (*b*) given below:

   a. from the total 'direct' educational expenditure of middle schools, the expenditure for the primary stage enrolment—located in middle school—was deducted as per above calculations to arrive at a net figure of direct educational expenditure relevant to middle stage enrolment.

   b. the portion of middle stage enrolment located in high/higher secondary schools was valued at the average per pupil cost of middle schools and high/higher secondary schools.

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[7] The educational expenditure comprises of two parts. One of which may be referred to as 'direct' expenditure and the other as 'indirect' expenditure. The direct expenditure is incurred directly for running the educational institutions. Broadly speaking, it includes expenditure on salaries of staff, contingencies, recurring expenditure on equipment, maintenance of buildings, etc. Indirect expenditure is that part of the educational expenditure which is other than the direct expenditure. It covers expenditure on direction, inspection, buildings (other than maintenance), non-recurring equipment, scholarships, stipends and other financial concessions, hostel charges (excluding mess charges), etc.

iii. After having apportioned the direct educational expenditure for the primary and middle stages in the manner explained above, the remaining direct educational expenditure incurred on the three types of educational institutions of the GSE has been allocated to the high and higher secondary stage.

The above assumptions and calculations provide the following distribution of the total direct educational expenditure among the three stages of the GSE for the years 1955 and 1965.

TABLE 2

ALLOCATION OF DIRECT EDUCATIONAL EXPENDITURE AMONG THREE STAGES OF THE GSE IN 1955 AND 1965

S. No.	*GSE Stage*	*1955*		*1965*	
		Direct Expenditure (in Lakhs of Rs.)	*Percentage*	*Direct Expenditure (in Lakhs of Rs.)*	*Percentage*
0	1	2	3	4	5
1.	Primary	5,881	55·1	15,561	49·9
2.	Middle	2,596	24·3	7,205	23·1
3.	High/Higher Secondary	2,199	20·6	8,424	27·0

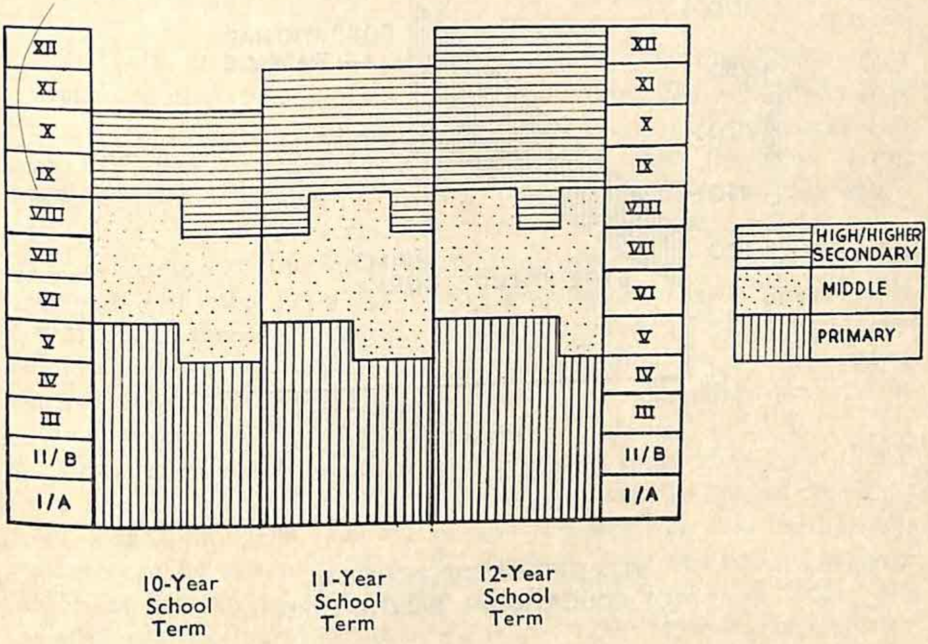
SOURCE: Basic data taken from the *Report of the Education Commission, 1964-66.*

If we now examine the distribution of the total direct educational expenditure devoted to the three stages of the GSE, we find that primary education claimed 55·1 per cent, middle stage education, 24·3 per cent and the high/higher secondary education, 20·6 per cent in 1955. These percentages for the three stages in 1965 were 49·9, 23·1 and 27·0 respectively. This distribution of total direct educational expenditure devoted to the GSE among the three stages can also be expressed as:

		1955	1965
E_p	=	0·551	0·499
E_m	=	0·243	0·231
E_h	=	0·206	0·270

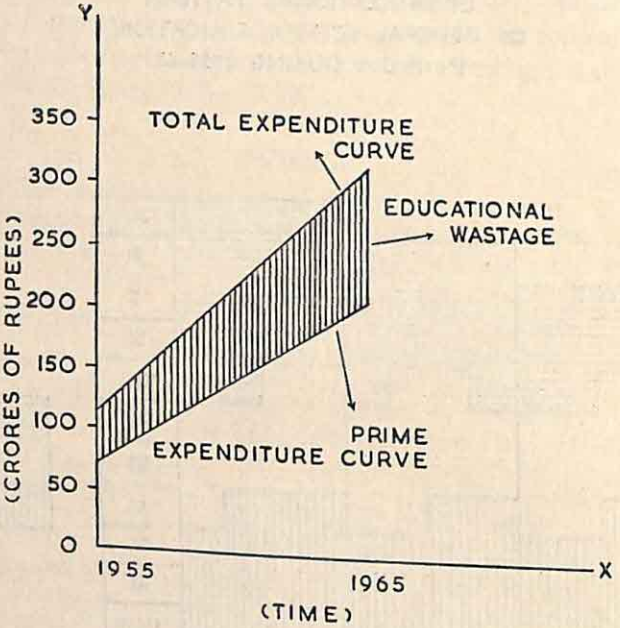
The above distribution of total direct educational expenditure devoted to the three stages of the GSE includes expenditure incurred on educational wastage. The proportion of the direct educational expenditure actually incurred to finance the fruitful and productive part of the GSE system

ORGANIZATIONAL PATTERN OF GENERAL SCHOOL EDUCATION IN INDIA DURING 1955-65

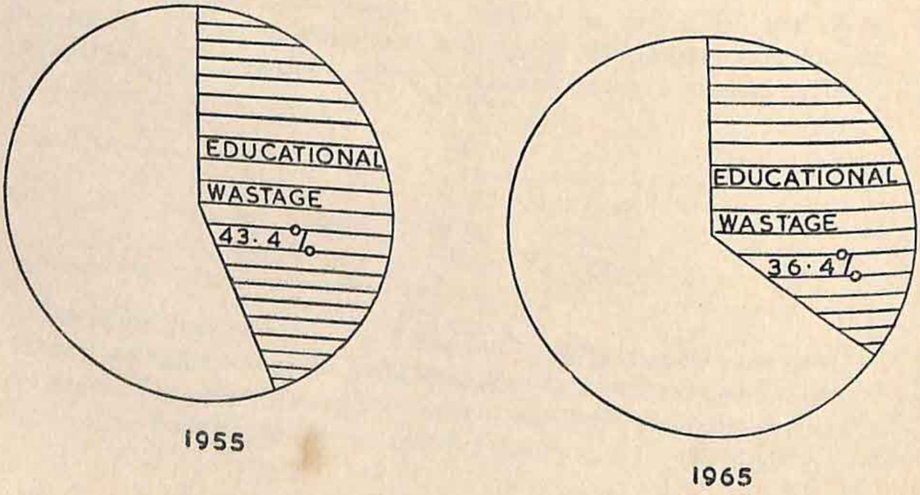


EXPENDITURE ON GENERAL SCHOOL EDUCATION

EXPENDITURE ON G.S.E



PERCENTAGE DISTRIBUTION OF EDUCATIONAL EXPENDITURE



can be calculated as follows:

1955	1965
i. E_p graduates $= \frac{0\cdot551}{2\cdot25} = 0\cdot2449$	E_p graduates $= \frac{0\cdot499}{1\cdot93} = 0\cdot2585$
ii. E_m graduates $= \frac{2\cdot243}{1\cdot35} = 0\cdot1800$	E_m graduates $= \frac{0\cdot231}{1\cdot25} = 0\cdot1848$
iii. E_h graduates $= \frac{0\cdot206}{1\cdot46} = 0\cdot1411$	E_h graduates $= \frac{0\cdot270}{1\cdot40} = 0\cdot1929$
EP_g graduates $= 0\cdot5660$	EP_g graduates $= 0\cdot6362$
EW_g graduates $= 0\cdot4340$	EW_g graduates $= 0\cdot3638$

The value of EP_g gives the percentage of direct educational expenditure which was used to pay for the completed studies. This, in other words, means the prime expenditure on the GSE. It may also be termed as the ' Efficiency Coefficient '. The amount by which the value of EP_g falls short of one shows the leakages due to educational wastage and is denoted by the Wastage Coefficient (EW_g). The EW_g coefficient gives the percentage of the direct educational expenditure used to pay for students who either never completed their studies as they left a particular educational stage of instruction in the middle of the course or took more than the prescribed time to clear it. This method can also be used to assess the relative productivity of educational expenditure incurred by different States in one and the same year.

In our specific case we see that 43·4 per cent of the direct educational expenditure, incurred in 1955 on the system, went to finance drop-outs and stagnation. The situation in 1965 comparatively improved as this percentage fell down to 36·4. In absolute terms the cost of wastage stood at Rs. 4,633 lakhs in 1955 and Rs. 11,353 lakhs in 1965. The distribution of the total cost of wastage among the three stages of the GSE for the years 1955 and 1965 is provided in Table 3.

TABLE 3

DISTRIBUTION OF DIRECT EDUCATIONAL EXPENDITURE INCURRED ON EDUCATIONAL WASTAGE, 1955 AND 1965

(Amount in Lakhs of Rs.)

S. No.	*GSE Stage*	*1955*		*1965*	
		Amount	*Percentage*	*Amount*	*Percentage*
0	1	2	3	4	5
1.	Primary Stage	3,266	70·5	7,516	66·2
2.	Middle Stage	672	14·5	1,430	12·6
3.	High/Higher Secondary Stage	695	15·0	2,407	21·2
	TOTAL	4,633	100·0	11,353	100·0

Limitations

The above efficiency coefficients are a crude measurement of the effectiveness of educational expenditure. They involve many issues for each of which refinements are necessary. The first limitation of the coefficients is that they are based on macro data and, therefore, do not take account of those factors which influence the cost efficiency at micro levels such as state, institution, rural/urban areas, etc. At these micro levels a number of adjustments have to be made for things like: (*a*) actual break-up of three stages of the GSE (*b*) length of school hours (*c*) type of management (*d*) examination systems (*e*) curricula content (*f*) quality of teachers (*g*) medium of instruction (*h*) quality of buildings and other equipment, etc. Even at the national level the coefficients suffer from two limitations. In the first instance they do not take into account the total cost of the GSE system and secondly, the stagnation indices for the year 1955 have been assumed to be the same as those for 1965, in the absence of data. All these factors play a dominant role in the efficiency of individual institutions and they in their turn definitely get reflected at the national level. However, for all this we require accurate and detailed statistics which we do not have at present.

Chapter Fifteen

Cost Reduction in Primary School Buildings

(*Use-Efficiency Method*)

R. D. Srivastava*

Introduction

In India there exists a continuously increasing demand for new school places and better teaching facilities with very limited available funds. Millions of school going children are required to be housed in school buildings to meet the national target of compulsory primary schooling. This would naturally require a huge number of school buildings. It is, therefore, necessary that every possible economy be achieved in the planning and architectural, physical and structural designing of new schools. All concerned have also to ensure that no unused spaces are included in the future plans of schools and also all available existing spaces are used to their maximum.

In India very little information is available regarding cost indices and space and construction standards for various types of school buildings. The need for such data having been realized it was decided to conduct research and investigations on school buildings at the Central Building Research Institute. To start with, basic information for standards on teaching spaces, storage and site spaces for primary schools were formulated, keeping in view the educational and functional requirements of the schools.

To achieve further economy a study on use-efficiency of school spaces and comparative cost indices was taken up. The former is aimed at finding out how economies in spaces could be affected through careful planning of school buildings and continuous use of space throughout the school day.

Use-Efficiency

There are several ways of estimating the relative economy of a building.

a. By comparison between the gross area available for teaching and the remaining area of the school.

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*This study was carried out by the Central Building Research Institute, Roorkee, and it was presented in the Seminar with the permission of the Director, CBRI.

b. By comparison of a number of schools in respect of areas of different spaces.

c. By comparison of covered area per pupil considering various functions.

d. By comparison of cost per student place.

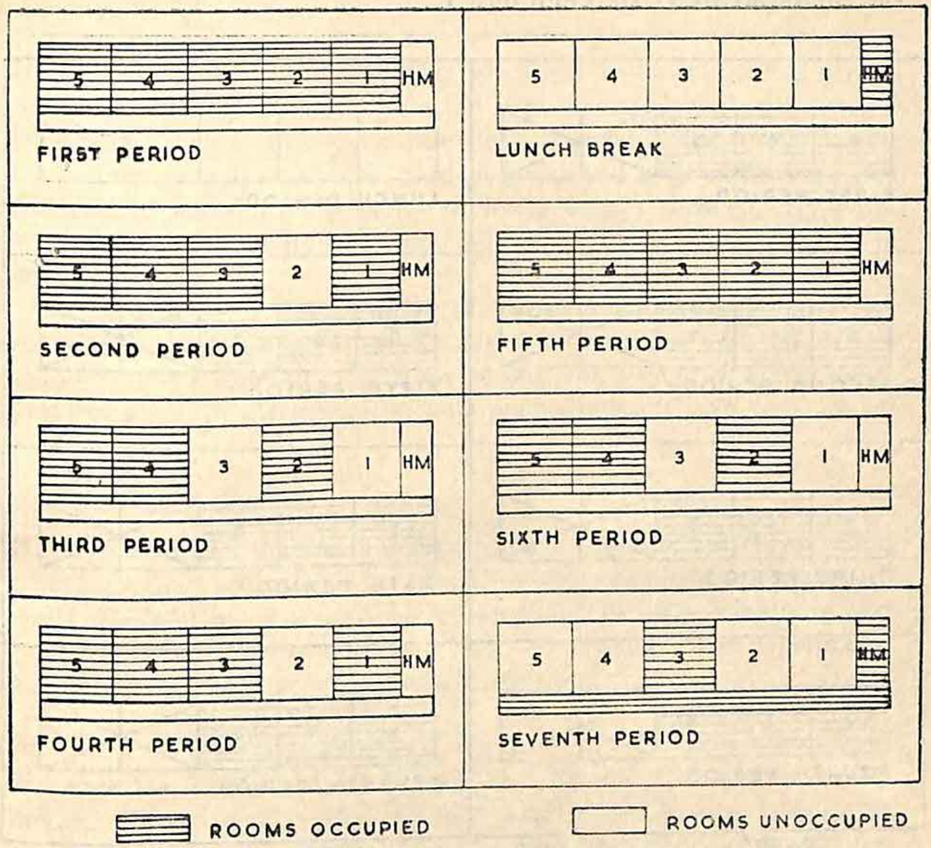
None of the above methods indicate the degree to which the spaces are used. It was, therefore, necessary to study the teaching time table in relation to the plan of the building. From this it was possible to express the actual use of each space in relation to the length of the school day during which the building was in use. The use-efficiency was defined as the ratio between the actual and ideal use per sq. ft. per hour. The actual use was area of space used multiplied by time and the ideal use was total area of space multiplied by total school time.

A typical school building plan of five classrooms (Fig. 1) was related to the time table being followed in local a primary school. The time table in terms of outdoor and indoor periods is also indicated in the figure. The 5¼ hours (10-00 A.M. to 3-15 P.M.) teaching day with eight periods of forty minutes each (including one lunch period) was the general pattern. The study revealed that the use-efficiency of school building was 52 per cent and the occupancy of verandah and headmaster room was as low as 25 per cent. The use-efficiency of classes ranged from 51 to 76 per cent.

To achieve economy in buildings, the increased use-efficiency was attained by eliminating less used spaces; and by rational application of teaching periods in the school plan. By eliminating verandah and headmaster's room use-efficiency of school building increased to 63 per cent and an economy of 25 per cent in space was obtained. These spaces may be desirable features of schools but since their elimination do not strictly affect education, they may be left out till more funds are made available. In an effort to achieve optimum use of classroom spaces, the time table was analysed and rearranged. The rational application of the time table to school building plan (Fig. 2) indicated that a primary school could well function within three classrooms only. It increased use-efficiency to 85 per cent and also economised 40 per cent in the overall teaching space requirements.

Study of Educational Problems

Before any final conclusion could be drawn out of the above study it was considered necessary to study that the standard of instruction did not suffer on account of this economy. With this in view, the study of educational efficiency was undertaken in collaboration with education officials of the education department of Saharanpur district (U.P.). During the first stage of study an effort was made to identify the subjects



TEACHING PERIODS

Class	*Inside Periods*	*Outside Periods*
I	4	4 (including one Lunch Period)
II	4	4 ,, ,, ,, ,,
III	5	3 ,, ,, ,, ,,
IV	6	2 ,, ,, ,, ,,
V	6	2 ,, ,, ,, ,,

Area of each Classroom 7·32×6·1 M=44·55 M^2
Area of Verandah 39·62×1·52 M=60·22 M^2
Area of HM. Room 3·05×6·1 M=18·60 M^2

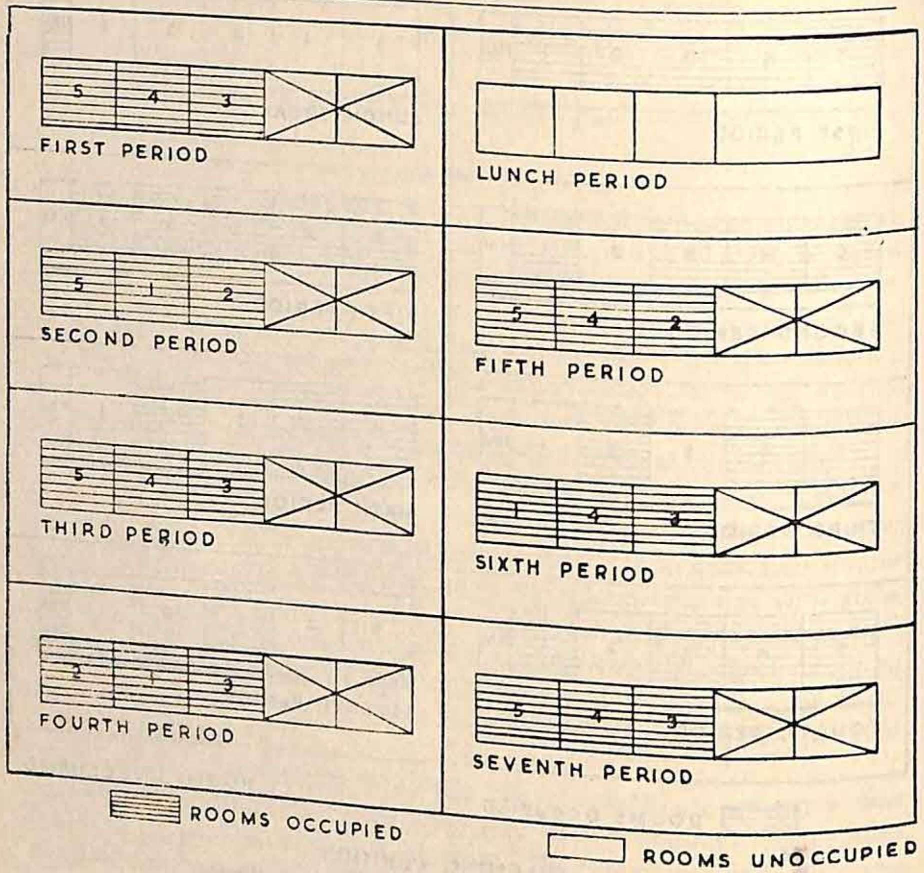
USE EFFICIENCY OF SPACES

Class I Actual use 44·55 M^2 used for 2·7 hours =120·40 M^2 hours
Ideal use 44·55 M^2 for 5·25 hours =234·11 M^2 hours
Use-Efficiency $\frac{120{\cdot}40}{234{\cdot}11}$

U.E. Class I =0·51
,, Class II =0·51
,, Class III =0·63
,, Class IV =0·76
,, Class V =0·76
,, Verandah =0·25
,, HM. Room =0·25

USE-EFFICIENCY OF THE SCHOOL=0·52.

FIG. 1.



TEACHING PERIODS

Class	*Inside Periods*	*Outside Periods*
I	3	4 including 1 Lunch Break
II	3	4 ,, ,, ,, ,,
III	5	3 ,, ,, ,, ,,
IV	5	3 ,, ,, ,, ,,
V	5	3 ,, ,, ,, ,,

USE-EFFICIENCY

Actual use 133·77 M^2 used for 4·6 hours=615·34 M^2 hours
Ideal use 133·77 M^2 used for 5·25 hours=702·3 M^2 hours

$$\text{USE-EFFICIENCY}=\frac{615{\cdot}34}{702{\cdot}3}$$

$$=0{\cdot}85$$

FIG. 2.

which could easily be taught in open spaces on the basis of actual performance of instructional practices. It was observed that the activity programme such as physical culture including games for lower classes; basic crafts such as clay work, gardening, art and local crafts, etc.; and teaching of multiplication tables to lower classes through clay balls, sticks and other activity methods could easily be taught in open or in sheltered spaces.

In the existing common pattern of instructions, classes I and II are required to attend schools at 10 A.M. and continue upto closure of school. It is a long and strenuous period for a child of six or seven years of age. In the new time table grades one and two were let off in the last period.

Actual Trials in Schools

Having identified the subjects which could be taught in open and after studying other educational problems, it was considered necessary to study the implications by actual observations in forty schools in and around Roorkee having basic education curriculum. The experiments were conducted on rainy days and on clear days.

Experiments on Rainy Days

Since outdoor teaching was not possible, it became necessary to accommodate all students in the building itself. Two classes had to be combined, keeping in view their teaching standards. Combination of class I with class II was always troublesome because of greater number of children in each class and also because of their childish habits. Combination of classes IV and V and III and IV worked tolerably well. Evidently, normal time table was suspended during these days of class combination and certain work was undertaken which could sustain interest of both the classes. For example, in language periods recitation and composition could be taught easily. In Arithmetic period recapitulation of multiplication tables and mental arithmetic proceeded on well. In Social Studies period narration of simple stories and recapitulary questions did well. It was felt to be a poor compensation for the normal teaching work but the number of such days being very small against the economy in huge amount to be spent on construction of school buildings, it was felt that the system could be made workable. The use-efficiency of the spaces were found to be 85 per cent.

Effort was also made to achieve 100 per cent use-efficiency of spaces during school day by staggering mid-day lunch time but this did not find favour with the teachers. The time table was therefore finally revised with the following considerations:

a. The mid-day lunch break to be the same for all classes.

b. Three classes to be inside the building and two classes for outdoor teaching to have the same subject such as gardening, physical training, crafts work or games.

c. The number of shifting of classes to be kept to minimum.

d. No space to remain unused.

Observations

a. Some space was required for keeping *bastas* (satchels) of students while changing classes.

b. During bright sun outdoor teaching activities were uncomfortable.

c. Outdoor lessons for activity and creative work necessitated physical movement and the students felt refreshed and invigorated to receive the next lesson.

d. On an average five minutes were spent in changing classes.

e. A great responsibility fell upon the teachers to plan their lessons ingeniously so as to finish it in time.

A solution to some of the above problems could be found in providing some device to keep *bastas* outside on *tat-patti* with marked numbers. Some sheltered spaces should also be provided for outdoor activities during inclement and hot weather. The students could be taught to move in a line in a disciplined manner which would minimize the time in shifting of classes.

Findings of the study

1. Three classrooms with a sheltered space, instead of five, are adequate.
2. Optimum use of spaces is attained with 85 per cent use-efficiency.
3. Students learn more activity programme, which, though included in the curriculum, is not adopted in practice.
4. Standard of instruction improves.
5. Students take more interest in their lessons.

Time Table

A typical time table has been prepared to indicate the adjustment of the outdoor and indoor periods in relation to the plan of the school buildings. The time table will vary as per local conditions and limitations of the schools. The subject 'craft' in the time table includes art work, clay work, spinning, weaving, paperwork, needle work, knitting work, drawing and modelling, etc.

Development of School Building Plan

On the basis of the above study, several alternate plans for schools of various enrolments both for rural and urban areas and also for different climates have been developed. For further economy rationalized construction and design specifications have been worked out for self help project, possibilities of partial prefabrication have also been exploited. School building plans for rural areas have been prepared with due consideration of technical know-how, limited financial provision and locally available materials.

Specification and Cost

The specification and cost of school building will vary from locality to locality depending upon the availability and cost of materials and labour in those places. A typical set of specifications has been prepared (Annexure 2). In Roorkee a school based on proposal No. 6 has recently been constructed by Roorkee Municipal Board. It covers a plinth area of 2050 sq. ft., and has been constructed for Rs. 13,200·00. This works out to be Rs. 6·50 per sq. ft. It provides for an enrolment of 200 students with furniture in classrooms 20 × 24 ft. in size. If the same school is designed for squatting the classroom sizes can be reduced to 16 × 20 ft. and cost of construction can be kept within Rs. 10,000·00. The specifications and detailed costing has been given in (Annexure 3 and 3 A).

ANNEXURE 1

SUGGESTED TIME TABLE FOR PRIMARY SCHOOLS

Class		*1st period*	*2nd period*	*3rd period*	*4th period*		*5th period*	*6th period*	*7th period*
V	PRAYER	Regional language	G. Science and Agriculture	Maths.	Games and P.T. (outside)	MIDDAY LUNCH BREAK	English or other language	Craft (outside)	Social Study
IV		Regional language	Craft (outside)	English or other language	Games and P.T. (outside)		Maths.	Social Study	General
III		Social Study	Craft (outside)	Regional language	Maths.		Games and P.T. (outside)	English or other language	General Science
II		Craft (outside)	Maths.	Games and P.T. (outside)	Regional language		Social Study	Counting and tables (outside)	...
I		Craft (outside)	Regional language	Social Study (outside)	Regional language		Games and P.T. (outside)	Maths.	...

ANNEXURE 2

TYPICAL SPECIFICATIONS

Element	*Specification*
Foundation Plinth	Cement concrete 1 : 5 : 10 (1 cement, 5 local sand, 10 stone or brick ballast). *Or* Lime concrete 1 : 2 : 8 (1 lime, 2 surkhi, 8 brick ballast). Brtck work in cement mortar 1 : 6 (1 cement, 6 local sand). *Or* Brick work in lime mortar 1 : 2 (1 lime, 2 surkhi). *Or* Square rubble masonry covered in cement mortar 1 : 6. Damp proof course 1 in. thick of cement concrete 1 : 2 : 4 with a coat of hot bitumen. *Or* Damp proof course 3/4 in. thick of cement mortar 1 : 2 with water proofing material.
Superstructure	Brick work in mud mortar. Columns, jambs of doors and windows, 6″ above plinth level, and below roof level brick work to be in cement mortar 1 : 6. *Or* Sun dried brick work in panels, with columns and masonry upto sill level in cement mortar 1 : 6. *Or* Random rubble masonry in cement mortar 1 : 6. Lintel and chajja with RCC precast, or reinforced brick.
Roof	(i) Flat Reinforced brick; or jack arch; or brick tiles on wooden rafters; or stone slabs resting on precast beams or precast cored unit (CBRI) or D.C. tiles (CBRI). (ii) Sloping Corrugated asbestos cement sheet or thatch supported on bamboo or wooden rafters or slate tiles.
Doors and windows	Battened and braced doors; glazed windows in local wood or wooden louvered windows.
Floor	Brick on edgeflooring with joints grouted with cement mortar 1 : 4. *Or* Stone tile flooring over 1/2″ thick base of cement mortar. *Or* C.C. flooring.
Finishes	Cement plaster 1 : 6 and white wash. *Or* Brick pointing outside in cement mortar 1 : 4 outside and cement plaster with white wash inside. All wood work to be nil painted.

ANNEXURE 3

SPECIFICATIONS OF SCHOOL BUILDING PROPOSAL No. 6

Foundation and Plinth	Cement concrete 1 : 5 : 10 with stone ballast; brick work in cement mortar 1 : 6, 3/4 in. thick damp proof course in cement mortar 1 : 4 with water proofing compound.
Superstructure	Brick work in mud mortar except in columns, jambs of doors and windows, 6 in. above plinth level and below roof level wherein brick work in cement mortar 1 : 6. R B work in lintels and chajjas.
Roof	Reinforced brick work in cement mortar 1 : 3 with lime concrete terrace (1 : 2 : 8).
Doors and windows	Sal wood frames, Deodar wood battened door and glazed windows.
Floors	1 in. thick cement concrete 1 : 2 : 4 laid in panels over consolidated brick ballast.
Finishes	Cement plaster 1 : 6, white washed inside. Flush pointing outside in cement mortar 1 : 4; all wood work oil painted.
Fittings	1½″ thick precast RCC shelves 1 : 2 : 4; chalk boards of cement mortar 1 : 3 finished with black-Japan. Local wood almirahs.

ANNEXURE 3 A

DETAILS OF COST OF SCHOOL BUILDING UNDER PROPOSAL No. 6

S. No. Item	*Qty.*	*Rate/unit*	*Amount*
		Rs.	Rs.
Foundation and Plinth			
1. Earthwork in excavation in ordinary soil	948 cft.	25·00 %	23·70
2. Cement concrete 1 : 5 : 10 with stone ballast	187 cft.	150·00 %	280·50
3. Second class brick work in cement mortar	589 cft.	115·00 %	677·35
4. 3/4″ damp proof course in cement mortar 1 : 4 with water proofing compound	175 cft.	50·00 %	87·50
Superstructure			
5. Brick work in cement mortar 1 : 6	503 cft.	130·00 %	653·90
6. Brick work in mud mortar	1164 cft.	80·00 %	931·20
7. RB work in lintels and chhajjas	33 cft.	2·50 cft.	82·50
Roof			
8. RB roof in cement mortar 1 : 3 including cement plaster 1 : 3 in ceiling	1971 sft.	1·20 sft.	2365·20
9. 4″ thick lime concrete terracing 1 : 2 : 8	1971 sft.	0·46 sft.	906·66
10. Mild steel reinforcement in RB work	4500 lb.	0·50 lb.	2250·00
11. Painting top of roof with hot bitumen using 35 lbs. per 100 sft.	1971 sft.	0·20 sft.	394·20
12. Providing and fixing 5/8″ dia. fan hooks	12 nos.	2·00 each	24·00
13. RCC 1 : 2 : 4 in beams	195 cft.	4·50 cft.	877·50
Doors and Windows			
14. Sal wood frames	118 cft.	16·00 cft.	188·80
15. M.S. holdfasts	48 nos.	2·00 each	96·00
16. Deodar wood glazed shutters	137 sft.	4·00 sft.	548·00
17. Deodar wood panelled shutters	38 sft.	4·50 sft.	171·00

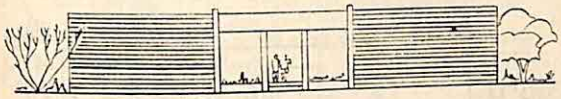
ANNEXURE 3 A (*cond.*)

S. No. *Item*	*Qty.*	*Rate/unit*	*Amount*
		Rs.	Rs.
Floors			
18. 1″ cement concrete 1 : 2 : 4 laid over consolidated brick ballast 3″ thick	1850 sft.	52·00 %	962·00
19. Earth work in filling under floors	1400 cft.	100·00 %	140·00
Finishes			
20. Cement plaster 1 : 6	4650 sft.	17·00 sft.	790·50
21. Cement pointing 1 : 4	650 sft.	13·00 sft.	84·50
22. Priming and two or more coats of oil painting on wood work	400 sft.	17·00 sft.	68·00
23. White washing	6650 sft.	1·00 %	66·50
Fittings			
24. RCC 1½″ precast shelves	18 cft.	4·80 cft.	86·40
25. Construction of black-boards	3 nos.	20·00 each	60·00
26. Local wood almirahs	5 nos.	75·00 each	375·00
TOTAL			13,190·91

Plinth area 2050 sft.

Cost per sft. Rs. $\frac{13,200\cdot00}{2050}$ = Rs. 6·44

Say Rs. 6·50



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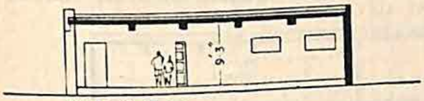

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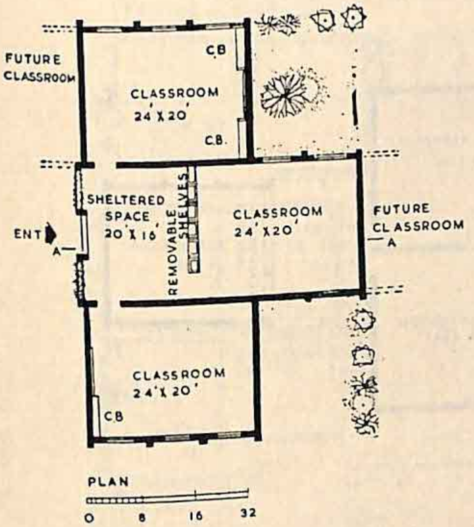


PROPOSAL No. 1

NOTE:—

The classroom size 24′—0″ × 20′—0″ is suitable for furniture arrangement.

The classroom size for squatting arrangement would be 20′—0″ × 16′—0″.

Minor adjustments in plans may be made according to climate and availability of local materials.

The lavatory block shall be adjusted on site.

CENTRAL BUILDING RESEARCH
INSTITUTE, ROORKEE

PRIMARY SCHOOL
200 ENROLMENTS

DELT S. NAGPAL	ARCHITECT
TRACED T. PRASHAD	R. D. SRIVASTAVA N. D. ARCH, A.I.I.A.

PROPOSAL No. 2

NOTE:—

The classroom size 24′—0″ × 20′—0″ is suitable for furniture arrangement.

The classroom size for squatting arrangement would be 22′—0″ × 16′—0″.

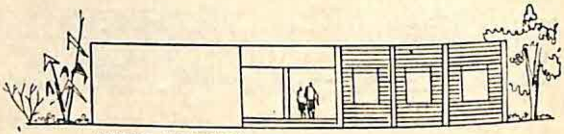
Minor adjustments in plans may be made according to climate and availability of local materials.

The lavatory block shall be adjusted on site.

CENTRAL BUILDING RESEARCH
INSTITUTE, ROORKEE

PRIMARY SCHOOL
200 ENROLMENTS

DELT S. NAGPAL	ARCHITECT
TRACED T. CHAND	R. D. SRIVASTAVA N. D. ARCH, A.I.I.A.



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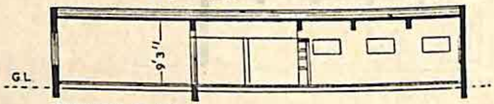

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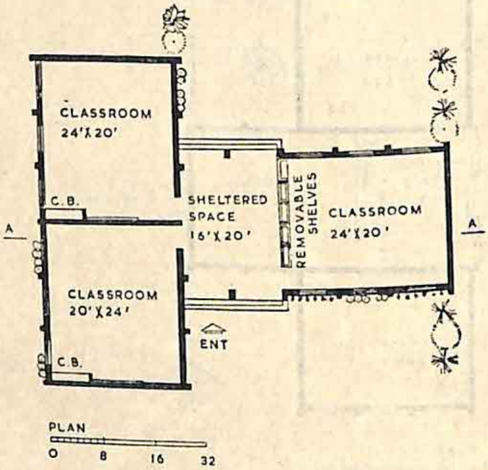
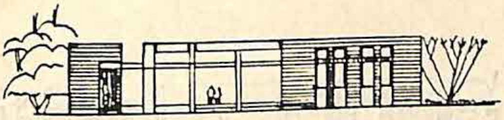
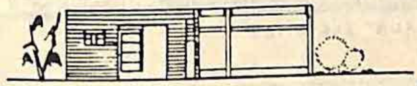




SIDE ELEVATION



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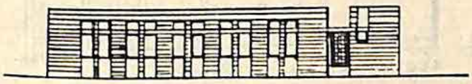
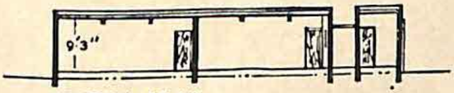


LEFT SIDE ELEVATION



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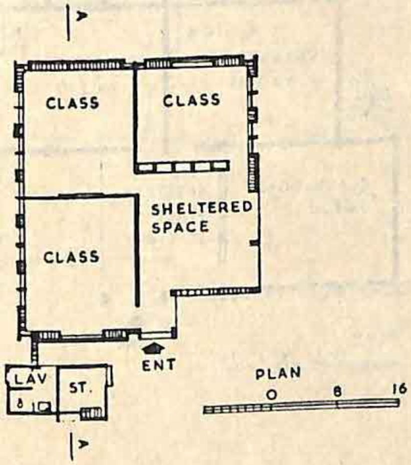


PLAN

PROPOSAL No. 3

NOTE:—

The classroom size 24′—0″× 20′—0″ is suitable for furniture arrangement.

The classroom size for squatting arrangement would be 20′—0″× 16′—0″.

Minor adjustments in plans may be made according to climate and availability of local materials.

The lavatory block shall be adjusted on site.

CENTRAL BUILDING RESEARCH
INSTITUTE, ROORKEE

PRIMARY SCHOOL
200 ENROLMENTS

DELT S. NAGPAL	ARCHITECT
TRACED T. PRASHAD	R. D. SRIVASTAVA N. D. ARCH, A.I.I.A.

PROPOSAL No. 4

NOTE:—

The classroom size 24′—0″ × 20′—0″ is suitable for furniture arrangement.

The classroom size for squatting arrangement would be 20′—0″ × 16′—0″.

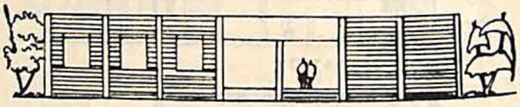
Minor adjustments in plans may be made according to climate and availability of local materials.

The lavatory block shall be adjusted on site.

CENTRAL BUILDING RESEARCH
INSTITUTE, ROORKEE

PRIMARY SCHOOL
200 ENROLMENTS

DELT S. NAGPAL	ARCHITECT
TRACED T. CHAND	R. D. SRIVASTAVA N. D. ARCH, A.I.I.A.



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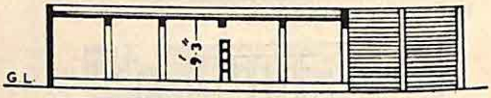

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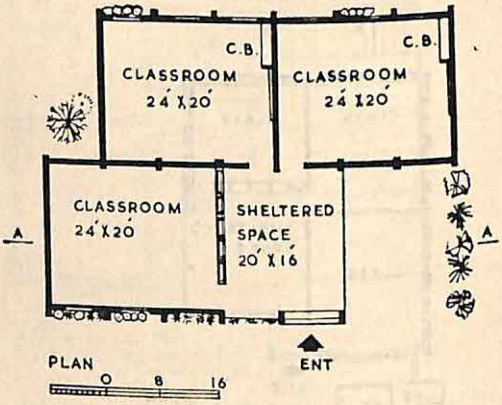
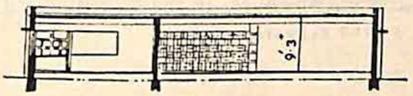


PLAN



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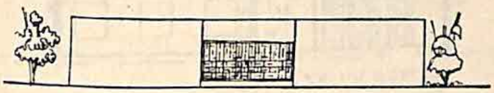

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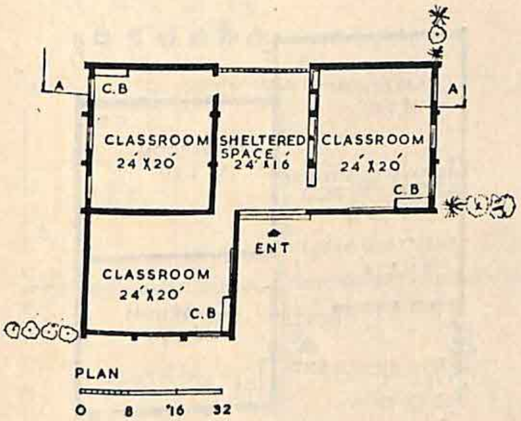


PLAN

PROPOSAL No. 5

NOTE:—

The classroom size 24′—0″ × 20′—0″ is suitable for furniture arrangement.

The classroom size for squatting arrangement would be 20′—0″ × 16′—0″.

Minor adjustments in plans may be made according to climate and availability of local materials.

The lavatory block shall be adjusted on site.

CENTRAL BUILDING RESEARCH
INSTITUTE, ROORKEE

PRIMARY SCHOOL
200 ENROLMENTS

DELT S. NAGPAL	ARCHITECT
TRACED T. CHAND	R. D. SRIVASTAVA N. D. ARCH, A.I.I.A.

PROPOSAL No. 6

NOTE:—

The classroom size 24′—0″ × 20′—0″ is suitable for furniture arrangement.

The classroom size for squatting arrangement would be 20′—0″ × 16′—0″.

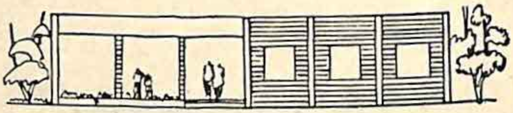
Minor adjustments in plans may be made according to climate and availability of local materials.

The lavatory block shall be adjusted on site.

CENTRAL BUILDING RESEARCH
INSTITUTE, ROORKEE

PRIMARY SCHOOL
200 ENROLMENTS

DELT R. SAHIJPUAL	ARCHITECT
TRACED T. PRASHAD	R. D. SRIVASTAVA N. D. ARCH, A.I.I.A.



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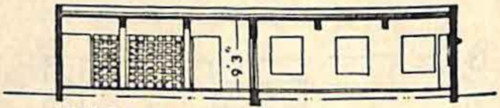

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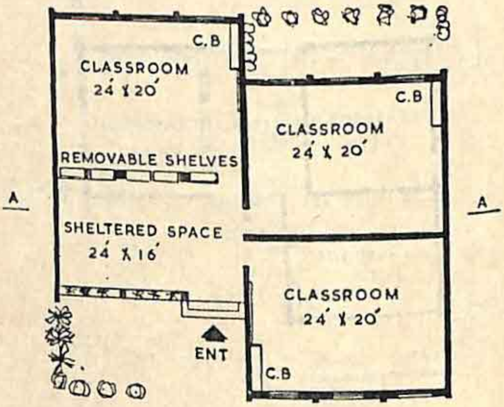
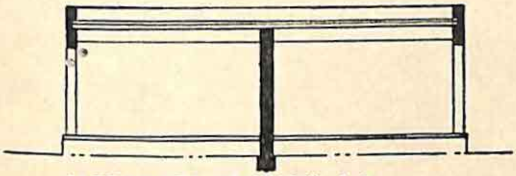
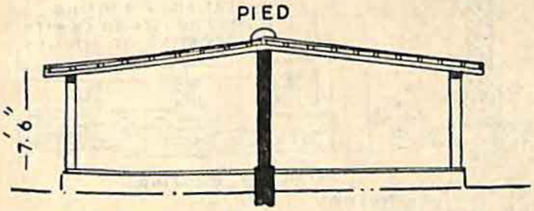


PLAN



ALTERNATE SECTION AA



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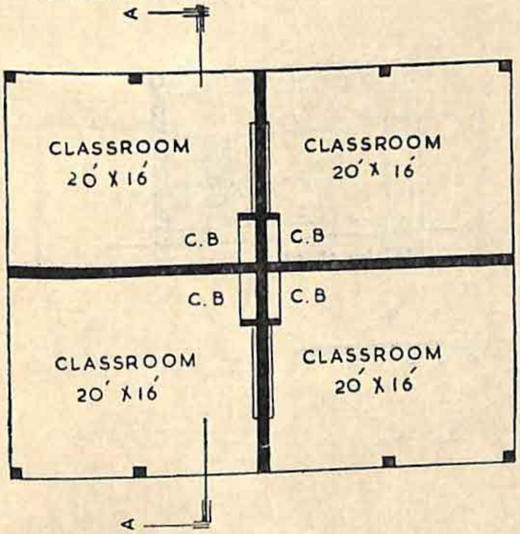


PLAN

PROPOSAL No. 7

NOTE:—

The material and other details will change according to regional variations.

CENTRAL BUILDING RESEARCH
INSTITUTE, ROORKEE

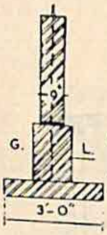
VILLAGE PRIMARY SCHOOL

DELT
S. NAGPAL

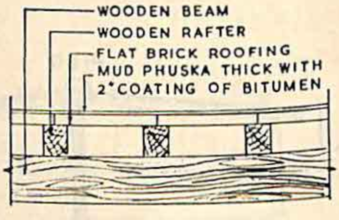
DELT
S. NAGPAL

R. D. SRIVASTAVA
N. D. ARCH, A.I.I.A.

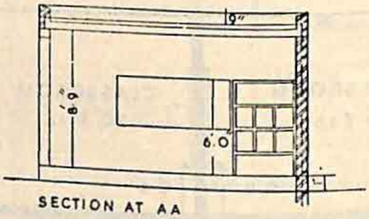
PROPOSAL No. 8



DETAIL OF FOUNDATION
ON HARD SURFACE



DETAIL OF ROOFING

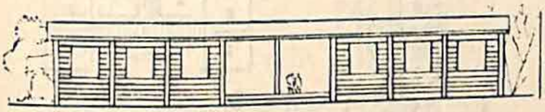


SECTION AT AA

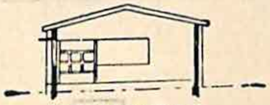
CENTRAL BUILDING RESEARCH
INSTITUTE, ROORKEE

VILLAGE SCHOOL DETAIL

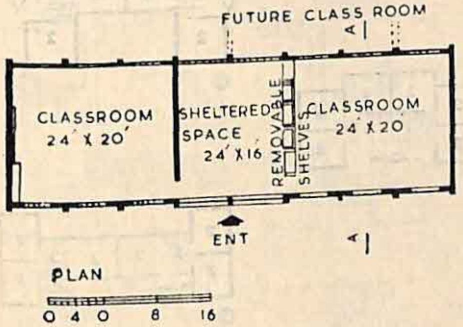
DELT S. NAGPAL	
DELT S. NAGPAL	R. D. SRIVASTAVA N. D. ARCH, A.I.I.A.



FRONT ELEVATION



SECTION AT A A



PLAN

PROPOSAL No. 9

NOTE:—

The classroom size 24′—0″ × 20′—0″ is suitable for furniture arrangement.

The classroom size for squatting arrangement would be 20′—0″ × 16′—0″.

Minor adjustments in plans may be made according to climate and availability of local materials.

The lavatory block shall be adjusted on site.

CENTRAL BUILDING RESEARCH
INSTITUTE, ROORKEE

PRIMARY SCHOOL
200 ENROLMENTS

DELT S. NAGPAL	ARCHITECT
TRACED T. CHAND	R. D. SRIVASTAVA N. D. ARCH, A.I.I.A

PROPOSAL No. 10

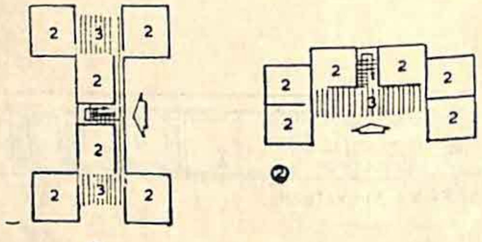
LEGEND

1. ENTRANCE
2. CLASSROOM
3. SHELTERED SPACE

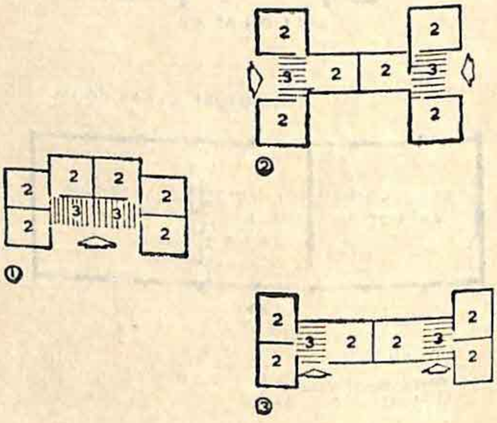
CENTRAL BUILDING RESEARCH
INSTITUTE, ROORKEE

SCHEMETIC PLANS OF PRIMARY SCHOOLS FOR 400 AND 800 ENROLMENTS

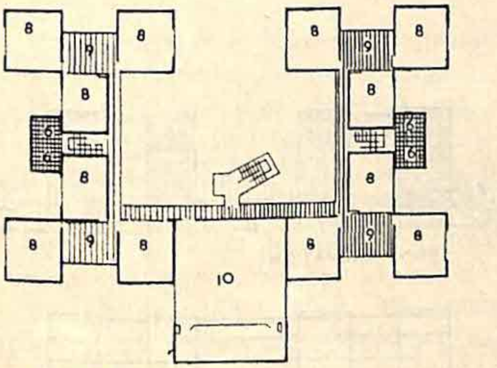
ARCHITECT
R. D. SRIVASTAVA
N. D. ARCH, A.I.I.A.



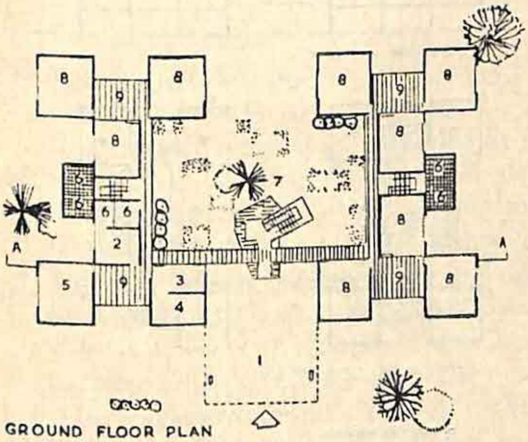
SCHOOL FOR 800 ENROLMENTS IN TWO FLOORS



SCHOOLS FOR 400 ENROLMENTS



FIRST FLOOR PLAN



GROUND FLOOR PLAN

0 16 32 64

MULTISTOREYED PRIMARY SCHOOL
FOR 3500 STUDENTS

PROPOSAL No. 11

LEGEND

1. ENTRANCE
2. PRINCIPAL'S ROOM
3. GENERAL OFFICE
4. RECORDS
5. TEACHERS COMMON ROOM
6. LAVATORY
7. OPEN
8. CLASSROOM
9. SHELTERED SPACE
10. MULTIPURPOSE HALL

NOTE:—

Size of classroom 24'×20".
Size of sheltered space 24'×16".

CENTRAL BUILDING RESEARCH
INSTITUTE, ROORKEE

ASSTT. ARCHITECT	ARCHITECT
V. K. MATHUR B. ARCH	R. D. SRIVASTAVA N. D. ARCH, A.I.I.A.

PROPOSAL No. 11 (A)

LEGEND

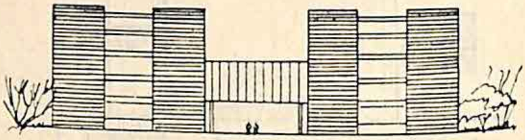
6. LAVATORY
8. CLASSROOM
9. SHELTERED SPACE

NOTE:—

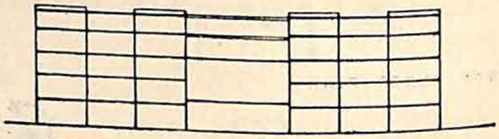
Clear height of the rooms shall be 9′×3″.

CENTRAL BUILDING RESEARCH
INSTITUTE, ROORKEE

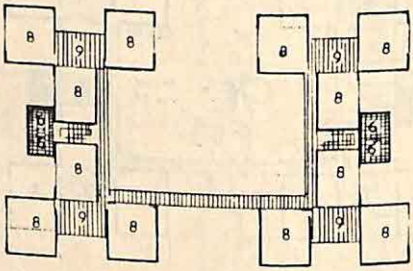
ASSTT. ARCHITECT	ARCHITECT
V. K. MATHUR B. ARCH	R. D. SRIVASTAVA N. D. ARCH, A.I.I.A.



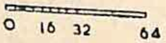
FRONT ELEVATION



SECTION AT A-A



TYPICAL FLOOR PLAN



Chapter Sixteen

Lighting of Teaching Spaces

V. Narasimhan and B. K. Saxena*

The importance of lighting as a prime factor in the functional efficiency of school buildings has to be recognized in the context of building design. The fact that it is precisely at the early and formative ages of five to twelve years children tend to develop functional ailments like defective vision, physical disorders and retarded mental growth, makes it all the more necessary to incorporate remedial measures at the design stage itself. Lighting, as the principal gateway to the brain in teaching spaces, when properly installed, can be more effective and economical than correcting functionally poor building. The purpose of this paper is to examine the various aspects of daylighting of teaching spaces with supplementary artificial lighting if necessary.

The Background

It is well known that in schools most of the childrens' study hours are taken up in executing visual tasks. They vary from the most simple to the most complicated, involving as they do so, the size of the viewed objects, the viewing distance and direction, and the brightness and contrast between the object and its surroundings. Reading the chalkboard is classified as a distant task while reading a book is a near task. The performance of any task with ease requires a minimum level of illumination such that the task becomes bright and the eye views it without effort. The emphasis on illumination as the basis for design has now been shifted to brightness and contrast in recent years.

Investigations[1] on the school childrens' sight, made jointly by the British Medical Research Council and the Building Research Board of Great Britain, led to the conclusion that for England a 2% daylight factor [or 10 Foot Candle (100 Lux)] illumination as the minimum that should be provided for on the desk tops in schools. The latter corresponds to the usual working plane in illuminating engineering.

While illumination is a measure of the light incident normally on a surface, it does not follow that the task should be visible with that illumination. This arises from the fact that unless the task reflects some of the light incident to the eye and that unless some minimum contrast exists between the task and the background, the task may not be visible at all. The importance of what is now known as the minimum perceptible contrast for normal vision leads to a better appreciation of vision engineering to teaching spaces. The two characteristics of vision are:

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*The present paper is based on joint research study conducted by the authors at the Central Building Research Institute, Roorkee (U.P.) and it is published with the permission of the Director, CBRI.

[1] Medical Research Council, *Report No. 173*, H. M. S. O. 1932.

—The eye automatically tends to look at the brightest point in the field of view and focus on a contrast; and

—The comfort to see and the ability to perceive are marred by glare.

The common statement that 'there is so much light in this room that it is dazzling' may be true even in situations where lighting levels may be reasonable but contrasts between adjacent areas in the field of view are such as to provide a discomfort in vision.

Since in schools, the assimilation of knowledge is through the medium of seeing, one may draw three pertinent criteria[2] for design:

a. The object of attention should be bright and contrasty;
b. The immediate background should be almost as bright but much less contrasty than the object; and
c. The environment should not contain bright patches that compete with the object.

Lighting of Teaching Spaces

With the three aforesaid factors in view one can examine how best lighting could be planned with reference to a tropical country like ours. It has been shown[3] that except during the monsoons the sky is generally clear on the plains and design of windows for daylighting can be based on such a sky assuming that sunlight does not shine on the windows. For design purposes, a sky luminance corresponding to that with the sun at an altitude of 15° has been suggested as appropriate together with an exterior design illumination from the sky equation to 8000 Lux. An interesting feature of this design is that since the horizon is brighter than the zenith, comparable amounts of daylight reach the walls and the working plane. The sizeable quantity of total illumination available on the horizontal plane outdoor results in a further enhancement of the illumination coming from the sky to any point inside the room. A complete analysis of the availability of daylight in a typical classroom in relation to illumination, brightness and task requirements is presented here.

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[2] W. A. Allen, *Report on School Planning and Construction*, R.I.B.A., Oct. 1947.

[3] V. Narasimhan and B. K. Saxena, *Lichttechnik*, Vol. 17, p. 95, A, 1965.

Floor Area and Window Size

It is reported[4] that in activity type of primary schools a room size of 7·3 m × 6·1 m is adequate for 40 pupils. Assuming such a room has unilateral daylighting from side windows, one can estimate the amount of daylight reaching several interior surfaces on clear days through windows of different sizes expressed as fractions of floor area. An assumption is made that windows run the entire length of the wall and piers are negligible in width and there are no external obstructions for daylight. The windows are glazed and the areas are not clear opening in the fenestration. This is for convenience of comparison.

Three surfaces are of interest. These are the working plane, the walls perpendicular and parallel to the window. The former is the table top and the latter the chalk and display boards on wall surfaces. The ceiling and walls are supposed to be lime washed with reflection coefficient of 0·7 and floor terrazo finished with a reflection coefficient 0·3. The ceiling height is taken as 3·05 m.

The availability of daylight from the sky (S.C.) and by inter-reflection (R.C.) has been calculated by the methods described elsewhere[5] are shown in Table 1. The effects of varying the sill height of the window are also shown. Sill height is measured from the floor level.

The figure in the Tables correspond to the expectable daylight illumination at the design time viz. about an hour and a half after sunrise or before sunset. The windows are supposed to be open.

It is seen that there is no linear relationship between window area and illumination indoors. This is because of the nonlinear sky luminance distribution. Every point in the room responds differently to an increase in window area. For example, with the sill height held at 105 cm a doubling of window area from 10% to 20% results in an increase of sky component from 0·0292 to 0·0672 at the centre of the rear wall and from 0·008 to 0·076 at the centre of the side wall. Similar is the variation of the reflected component and the total illumination.

It is useful to determine which combination of the window size and sill height will result in the most uniform illumination of the several room surfaces. Since the eye tends to look at the centre of every object perceived, it follows that the appearance of the central areas will give the clue. Also the brightnesses of the upper halves of the room surfaces rather than the lower ones is critical since students seated on the bench look toward the upper parts of the walls containing the chalk board of display charts. On this basis it is seen that a 15% to 20% fenestration at a sill height of 105 cm would be suitable. Since even a 15% fenestration could provide the required illumination of 20% D.F. for the daylight adapted eye this should be sufficient for performing all visual tasks normally encountered in the classroom.

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[4] R. D. Srivastava, *Indian Architect*, Vol. 6, p. 22-34, Sept. 1964.

[5] *a.* V. Narasimhan and B. K. Saxena, Precise value components for the clear design sky. *Indian Journal of Technology* (in press).

b. R. G. Hopkinson, *et. al.*, *Trans. Illm. Eng. Soc.*, Vol. 19, p. 201, London, 1954.

The fraction of the inter reflected component of daylight also varies from point to point. Increase of sill height generally results in an increase in the quantity of the above component. But this device should be used with caution, since increasing sill height results in a different distribution of the percentage increase of this component over the sky component on various interior surfaces.

Brightness Patterns: Table Tops and Chalk Boards

For best visual performance, it is recommended[6] that adjacent surfaces should have comparable brightnesses. Brightness is the product of illumination and reflection factor. Moon[7] showed that the ratio of brightness between the task and its immediate surrounding should not be less than 3 : 1. This is found to be possible for all surfaces in the room with a 15% fenestration at sill height 105 cm.

To further enhance the utility of this distribution it is desirable to consider the effects of the reflections of table tops and chalk boards. Large contrasts between printed paper (P = 0·7) and varnished table tops (P = 0·2) exist because of differences in reflections. To maximize ease of reading it would be desirable to finish table tops in light colours (P = 0·4 or more). This would result in better distribution of inter-reflected component as well.

The conventional blackboard (P = 0·05 to 0·01) has given way to light chalk boards (P = 0·4) in modern teaching spaces. While white chalk letters on black surfaces will result in greater contrasts, the continual shifts of vision from board to wall and back again results in greater visual strain. Light Pale green boards offer a simple solution. This taken together with a 15% fenestration, results in an enhanced general illumination on the board surface calculations[8] and show that for side walls where the average illuminations is 0·0767 and reflection coefficient is 0·7, the average brightness works out to be 425 spostilbs. For this adaptation level of the eye a test gap of 1 mm should be visible from any point in the room. Since in this calculation ideal conditions have been assumed, one may conclude that good visibility will prevail since one is not normally called upon to view a 1 mm test bar from 6·0 m distance.

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[6] *American Standard Guide for School Lighting, IIlm. Engg.*, Vol. 57,No. 4, 1962.

[7] P. Moon and D. E. Spencer, *Lighting Design, Addison Wesley*, 1948, p. 312.

[8] See for instance Parry Moon and D. E. Spencer, *Lighting Design, Addison Wesley*, 1948, Chap. 8, *et. seq.*

Glare

The presence of a patch or area with excessive brightness in the field of vision causes a sensation of glare. This arises because of the rising of the adaptation threshold and the consequent requirement of higher illumination for good visibility. To eliminate all glare in a room for every angle of view is difficult if not impossible. The best orientation for students will be to face a side wall and thus avoid looking into the windows. The other alternative will be to provide frosted window panes to cover the top halves of the fenestrations. This would, however, result in a small reduction of daylight indoors.

Maintenance

The presence of bars, sashes, glasspanes and dust on the panes cut off daylight. Wooden frames can reduce the light by as much as 30% while glass cuts off another 20%. The ultimate reduction can be as much as 50% when windows are closed. Steel frames are superior in this respect as the cut-off is only 16%. A schedule of cleaning at least twice a year will help maintain the levels of illumination at the stipulated value.

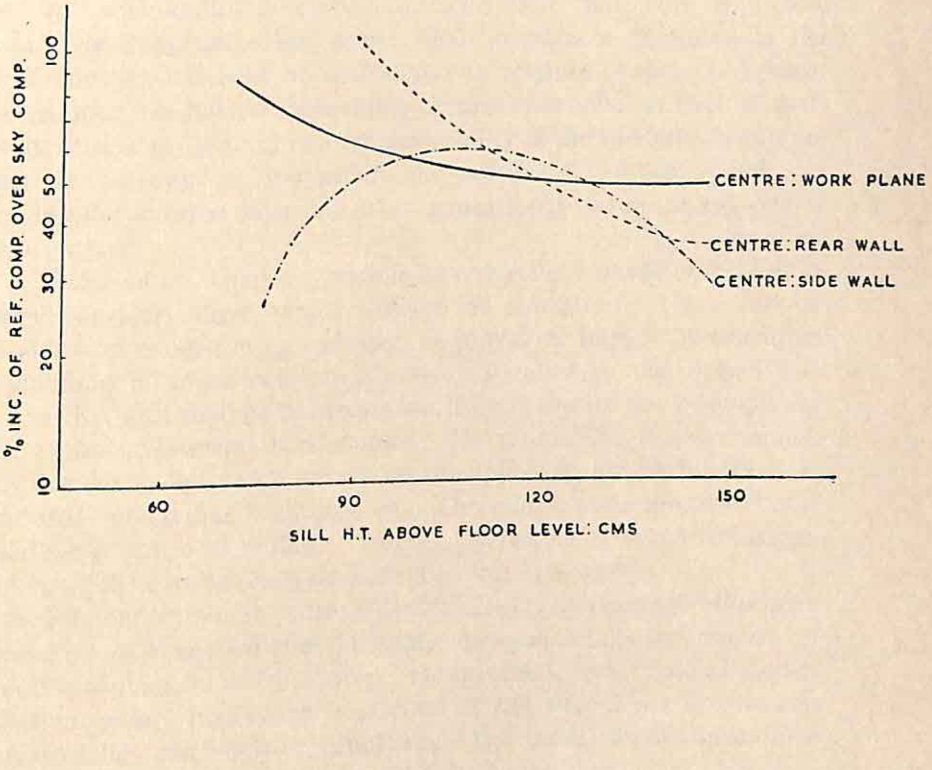
Supplementary and Artificial Lighting

In India where the levels of exterior daylight illumination are high and design has to cater for higher levels of adaptation, the installation of artificial light to augment daylight will be expensive. Since the design is exempted to hold good from 8 A.M. to 4·30 P.M. the need for supplementary lights will not arise except on a cloudy day. It would be preferable to have a lighting system capable of providing at least 100 Lux on the working plane. For the room under reference (7·32 × 6·1 × 3·05 m^3 with walls and ceiling of reflection coefficient 0·7 and floor 0·3) the solution lies in one of the two alternatives: It could be an incandescent system of 8 lamps of 100 watts with metal reflectors each 180 cm above the table and 2·70 m apart spaced properly inside; or a fluorescent system of 3 units with 2 lamps each with metal reflectors and grilled bottom, 180 cm above the table top and 2·40 m apart.

Conclusions

In the day-lighting design of classrooms one has to keep in view lighting levels in relation to the brightness of the environment. This leads to considerations of availability of daylight on horizontal and vertical surfaces. To prove the best visual environment in teaching spaces of a typical classroom of the size 7·31 m × 6·1 m × 3·05 m it is considered that the clear window area should be at least 15% of the floor area and the sill height should be 100 to 110 cm. It is also desirable to use light green coloured chalk boards and table tops to get the maximum advantage of the inter-reflected daylight. The daylight thus obtained will create good visibility of even 1 mm wide gaps at a distance of 20 inches during most of the working hours.

For artificial lighting at least a level of 100 Lux will be desirable but to provide a permanent supplementary level of artificial lighting may be expensive. Fluorescent lighting tends to be cheaper than incandescent lighting but both are expensive when compared to daylighting.


% INC. OF REF. COMP. OVER SKY COMP.
100
50
40
30
20
10
60
90
120
150
SILL H.T. ABOVE FLOOR LEVEL: CMS
CENTRE: WORK PLANE
CENTRE: REAR WALL
CENTRE: SIDE WALL

Section III

Economic Criteria for Investment in Education

Papers in this section present the rationale and approach for investment strategies in the field of education.

R. S. Queener's paper *Use of Economic Criteria for Educational Decision Making* points out that educational planning especially in India is based more on socio-political considerations rather than on economic criteria. He suggests in his paper that investment planning in the field of education should be considered in relation to three important considerations: (*a*) relative desirability of an educational project *vis-a-vis* non-educational project, (*b*) relative desirability of the various educational project to solving a particular educational problem, and (*c*) improving the internal efficiency of an educational system or any one of its sub-systems.

P. R. Panchmukhi's paper *Economic Analysis and Planning of Education Industry* considers three major aspects of education. These include discussions on education as industry, employment impact of education and planning of investment in educational industry. He suggests in his paper that a single type of investment criteria should not be employed to the entire investment in education. He points out that techniques of cost-benefit analysis or rates of return approach are useful for non-educational outlays like buildings, etc. The manpower approach should be used for educational outlays. In fact, operations research techniques would bring the coordination between different approaches.

M. S. Ramanujam, in his paper *Planning Models for Optimum Allocation of Resources in Education* tries to apply programming techniques of allocations to the field of education. He proposes three types of models for this purpose. Instrument variables of the model are enrolments at various kinds and levels of education. The model finally, gives time profile of enrolment of each kind and level of education.

R. K. Sau's paper *Some Notes on Resource Allocation in India* gives a review of alternative approaches to the educational planning in India, namely, demand for places, rates of returns, and manpower requirements. He evaluates three types of approaches and strongly recommends for identifying areas where economic optimization techniques can be applied. The paper gives an input-output model for preparing educational plans.

V. B. Singh and T. S. Papola in their joint paper *Investment Effectiveness and Educational Planning* suggest for investigating three types of hypotheses: (*a*) we have over-invested in education, (*b*) there is huge wastage in education, and (*c*) educational investment has not been properly allocated so as to yield maximum returns. The authors review the entire situation and find that the hypothesis regarding over-investment in education is not worth investigation but he strongly recommends the validity of other two types of hypotheses.

Miss I. Z. Hussain in her paper *Returns Approach to Education Planning* shows the complementarity between three approaches, namely, social demand approach, manpower requirement approach and rates of return approach. She also presents empirical results about rates of return to different levels of education.

M. Sinha Roy in his paper *Productivity of Education with Special Reference to Under-developed Countries* raises certain problems regarding the application of the concept of capital to the investment planning in the field of education. He examines the alternative rates of return calculated by different authors for the same period and the same country. He finally, recommends for literacy drives and education regarding farming methods rather than the farm school education and relating the content of education with the knowledge required for developing capital equipment for the economy.

Chapter Seventeen

The Use of Economic Criteria for Educational Decision Making

ROBERT S. QUEENER*

The educational system in any country makes a considerable claim on that country's resources. Annual expenditures on education generally represents anywhere from 2–6% of gross national product and from 10–25% of the public budget. Moreover, the educational system employs large numbers of a country's high-level manpower. In India, for example, approximately 45% of its professional, technical, and related workers serve as teachers in the educational system.

In view of the educational system's requirements for a large share of a nation's scarce resources, it seems anomalous that expenditures on education have escaped the disciplined scrutiny commonly applied to investments in other sectors. Nevertheless, economic criteria have rarely been used to judge the wisdom of educational decisions. Generally these decisions are based on the socio-political demand for education, preconceived notions of how much education should be offered, attempts to emulate educational achievements of more advanced countries, or simply the desire to educate as many persons as the system can possibly accommodate.

In India, the basic justification for massive expenditures on education has been the feeling that education is a social right, as reflected in the Constitutional provision that all Indian children be educated at least to the age of 14. Further support derives from the belief that an educated populace is an essential ingredient of economic progress, and the mistaken impression that the speed of progress is directly proportional to the rapidity with which the population is educated. Economic considerations insinuate themselves only at the higher levels of education where expansion of facilities is at least partly justified by the need for educated workers to man various productive activities.

The usefulness of economic criteria for educational planning becomes more apparent when economists begin to consider education as an investment in human capital, paying returns in increased production. This new insight led to attempts to calculate rates of return to education, which could be compared to returns on investment in physical capital. It also brought in its train a manpower requirements approach to educational planning which attempts to relate the output targets of the educational system to the number and kinds of educated persons needed for productive roles in the economy.

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*Census of India, 1961.

These economic interpretations of the educational process have been strongly challenged on the basis that they ignore the grander purposes of education, by implying that:

a. education serves only to supply the needs of the labour force;

b. education should be judged solely on the basis of its economic returns.

Nevertheless there are at least three important types of educational decisions which should be subjected to economic tests:

a. Decision Area One: is investment in a particular educational project more or less economic than investment in other sectors?

b. Decision Area Two: which of several approaches to solving a particular educational problem is most economic?

c. Decision Area Three: how can the efficiency of the educational system or any of its sub-systems be improved?

Decision Areas Two and Three are actually two different perspectives on the same problem: insuring that educational objectives are achieved with minimum cost. Economic studies of education, therefore, are basically concerned with two issues: the external returns to education and the internal economic efficiency of the educational system.

Decision Area One

The first decision area requiring economic analysis is comparison of a proposed educational project with investment possibilities in other sectors. To permit comparison, the costs and benefits of the alternative investments must be expressed in terms of money and discounted to the present to indicate which investment yields the highest return.

There are two major objections to this type of approach. The first is the already stated one that education yields social and cultural benefits that cannot be monetized. The economic returns to a primary school education, for instance, might be calculated as the difference in lifetime earnings, on the average, between a primary school completer and one who has not enjoyed the benefit of such an education. Yet the calculation would ignore the fact that education has extended the individual's personal horizons and enabled him to make a more positive contribution to the social and political development of the nation. However, some educational projects have clear, definable economic objectives—*i.e.* a vocational training scheme to provide skilled craftsman for the labour force.

The second criticism is that even when the objective of an educational project can be defined in economic terms, the benefits of the project are difficult to measure. In the case of craftsmen trainees, the differential in their life-time earnings over their expectations before training might be used as an approximation of the additional production accruing to the economy as a result of their training. Yet wage-influences unrelated to productivity can make the trainees' differential earnings much less or much more than the differential product they contribute to the economy.

The costs of educational projects are simpler to determine. In a straightforward fashion, the capital and recurrent costs of a particular project can be estimated at market prices and totalled. Yet costing of educational projects is complicated by two problems which might require imputing higher costs than are actually paid for out of the educational budget:

a. the cost of income foregone by the student while in school and, implicitly, the production foregone by the economy. If there is large scale unemployment for persons of his age with his prior training and experience then this opportunity cost is zero; and

b. the fact that many students do not complete, the educational sub-system raises the unit cost of producing a completer. If $\frac{1}{3}$ of the students drop out before completion, then the unit cost of completion, becomes 50% higher. On the other hand, partial education may have some worth that should be valued.

Because calculation of the economic returns to education is so vulnerable to criticism and has only limited usefulness, more attention needs to be given to refining the economic criteria which assist decision-making concerned with the other two sets of problems.

Decision Area Two

A second area of educational planning which requires the application of economic criteria is the choice among alternative solutions to a particular educational problem. This process begins with defining the problem and specifying the objectives to be achieved. The problem might be a shortage of trained teachers, or the need to teach literacy to adults, or a desire to provide primary education for all children in rural areas. Alternative means of achieving the objectives must be costed and analysed to determine the optimal method, the one most efficient in economic terms. Generally this means translating the objective of a project into a desired output, expressing in terms of cost, that output and comparing unit costs of output for the various alternatives. The method with the lowest unit cost would be selected, assuming similar quality of output from different methods.

The selection of the unit of output is at the same time a crucial and perplexing decision. In the case of teacher's education, where the student must complete the course to acquire a certificate without which he cannot teach, the unit of output is clearly the completer. But in the case of primary education, is the unit of output a completer, or a student who achieves functional literacy whether or not he completes the course? The unit costs of the sub-system will vary considerably depending on what unit of output is chosen. Similarly what unit of output from a vocational education stream should be selected? To the extent that the student must receive a completion certificate to qualify for certain craft jobs, the completer would be chosen as the unit of output. But undeniably vocational education short of completion may still endow a student with skills that increase his potential productivity. How can this tangible benefit of vocational education be reflected in the output unit chosen?

A second conceptual problem is the variation in quality of the output. When two methods of solving a particular educational problem have substantially similar unit costs, the method resulting in the higher quality output is clearly preferable. But how does one choose the best alternative according to whether the quality of its output exceeds or falls short of the standard. For general academic education, this kind of computation would be fraudulent. Measurement of discrete quanta of quality in learning would be impossible. The only practical solution is to specify a desired level of quality and design alternative educational schemes to meet that quality standard. In comparison of unit costs, quality considerations, therefore, will not vary.

An important educational decision is how to train industrial craftsmen. This training can be accomplished through formalized institutional courses or through training within establishments, with or without government subsidy. Cost analysis of these alternate methods should indicate which method is more economical. For the institutional course, the cost of providing training to non-completers and to completers who do not obtain jobs for which they were trained must be prorated among these completers who do take up appropriate jobs. Thus craftsman training that costs Rs. 1,000 per student enrolled will cost Rs. 2,250 per unit output if one-third of the students do not complete and one-third of the completers cannot obtain a job in their field of training.

The training within establishment cost should be based on several assumptions about opportunities foregone the value of the instructors' time in production activity, the opportunity cost of the equipment used for training and of the trainees' time, etc., plus any salary or allowance paid to the trainees. If training is conducted during idle shifts, opportunity costs are zero and actual cost equals the overtime pay to the instructors, allowances to trainees, and any additional depreciation costs incurred by using the equipment for instructional purposes.

Since the purpose of craftsmen training is to provide a particular factor of production, the ultimate objective is work productivity. With the objective so defined, measurement of differences in quality of the training output is facilitated. The quality of a completer may be approximated by his productivity on the job, with the productivity of the establishment-trained craftsman chosen as the standard. As the productivity of the institutionally trained craftsman exceeds or falls short of the standard, the unit cost of the institutional course should be deflated or inflated accordingly. In the example given, if institutionally trained craftsmen, on the average, are only 90% as effective as those trained within industry, the unit cost of training a craftsman in an institution should be increased to Rs. 2,500. (In making comparisons of productivity, institutionally trained craftsmen should be compared only with establishment—trained craftsmen in the same or a similar establishment. Otherwise the other factors affecting labour productivity —management skills, capital intensity, the organization of production, etc.—cannot be assumed equal.)

Other educational situations which require analysis of the relative merits of alternate approaches are those in which new educational media or instruction methods might be utilized. These innovations mean different combinations of inputs into the educational process, having different cost implications.

A recent study by the I.I.E.P., *The New Media: Memo to Educational Planners* cautions that planners must define the particular problem to be solved before considering whether or not to use new media. ' Let the project not begin with a piece of new technology which someone thinks could or should be used. Above all, let it not begin as an excuse for adding technology which is primarily for other purposes. Rather, let it begin with an educational problem which is seriously and widely recognized, which cannot readily be solved by conventional means, and to whose solution one or more of the media would seem to be able to make a significant contribution '.

A careful economic analysis of comparative programmes, some of which use new media and others which do not, will assure that new media are not rejected out-of-hand as luxuries too expensive for a developing country to afford, but at the same time are not adopted for use when they are patently uneconomical. Media such as radio and closed-circuit television have high initial fixed costs. Yet unit costs can be reduced to much lower levels if the service permits wide instructional coverage. If the particular educational problem requires that large numbers of students be instructed, new media may prove more economic than conventional teaching methods.

Decision Area Three

The last set of problems deals with the efficiency of the educational process—maximizing output for given levels of inputs or minimizing inputs for a given level of output—and of increasing the productivity of each input (teachers, instructional plant, financial investment) in education.

Efficiency studies of education are crucial to every country. Simultaneous attempts to increase enrolments and improve quality cause educational costs to skyrocket. Efforts to raise the educational qualifications of teachers, to provide training for teachers, to increase the salaries of teachers in accordance with their improved qualifications, to reduce student/teacher ratios, to emphasize scientific and technical education, to improve instructional materials, all increase educational costs tremendously. Yet the need to improve the productivity of educational inputs has not received sufficient attention. The implication is that educational costs will rise beyond the capacity of educational-budgets to meet the costs. Clearly some attempt must be made to increase the productivity of inputs and decrease the unit costs of the educational process.

Measurement of educational efficiency depends on assessment of unit costs—*i.e.* what is the cost to produce one completer of the system or sub-system? Translation of the educational process into unit cost terms will facilitate identification of waste and inefficiency and may suggest the reasons for inefficiency. Unit costs for each level and type of education must be collected and compared. Costs may be expressed in terms of completers of the sub-system, one extreme that assumes that education short of completion yields no benefit, or in terms of average daily attendance, the other extreme which assumes that any given hour of instruction has value equal to any other hour, or some compromise parameter between the two. The parameter chosen should vary according to the type of education being analysed.

Again some standardization of quality or adjustment for quality differences is necessary; unit costs reflect not only the efficiency of the educational process but also the quality of instruction. The presumption is that improvements in quality usually costs more. Yet cost reductions which result in deterioration in quality must be avoided, *i.e.*, use of lower-cost, less qualified teachers. In the absence of reliable methods of measuring quality, the schools studied should be grouped in different quality classes, the classification based on rough parameters such as qualification of teachers, sophistication of curriculum, etc. A national inspection and evaluation system would facilitate such a division of schools.

Unit cost difference between schools in a particular quality class would indicate that some are more efficient than others. Differences in combinations of resources inputs or the technology of the teaching process should reveal why certain schools are lower cost producers. Some apparent reasons will be:

a. Some schools are too small to take advantage of economics of scale. Additional enrolment would not reduce quality of instruction but would result in lower average unit costs.

b. Some schools fail to utilize the full capacity of their staff of physical plant. In particular a faculty may be used to teach more instructional hours or may be supported by equipment and assistants that facilitate their spending more time on the professional aspects of teaching.

c. Some schools utilize teaching methods which are outmoded, which lend themselves to a slow learning process or to inefficient use of teachers' time in repetition exercise and monitoring.

d. Differences in efficiency represent, in part, differences in ability to retain the student inputs through the educational process to completion.

In studying the efficiency of the educational system, special attention must be given to the problem of student detention. Voluntary student drop-out is only partly related to the inability of the educational process to attract and hold the student's attention. It is more closely associated with the socio-economic environment of the student: parental encouragement to the child's studies the immediate contribution that the child can make to his family's standard of living—as a labourer or as a wage-earner, the inability of the family to support the costs of the child's education. Hence, although student drop-out inflates the actual unit cost of completers, it is due to factors extraneous to the educational system and which the system is powerless to correct. Just as some student drop-out must be accepted as a fact of life, some student failure must be considered necessary, as an instrument of maintaining quality standards. Otherwise the performance of some of the completers of that educational sub-system will not meet the standards desired of the system's output. In addition to drop-out which the system cannot control and failure which it must enforce, many students drop-out and many fail because of dull, low-quality instruction and insufficient personal attention being concentrated on borderline students. For these studen's, improvements in the educational process, perhaps even minor improvements, might be enough inducement for them to remain in the system. And in terms of efficiency, as long as the marginal cost of retaining one would be drop-out or failure is less than the average cost per-completer, such improvements are justified. Improved instruction will also help to reduce the number of repeaters in the system and the high costs associated with repetition of classes.

More research is needed to determine what happens to drop-outs and failures. How much of the education they have received is permanently retained? To what extent can the objectives of the educational sub-system from which they were removed be said to have been partially achieved? This research will enable the unit costs of output to be deflated accordingly. More important, what efforts are needed to salvage the education already invested in them—will special out-of-school courses be effective or must they be returned to the sub-system? In other words, what will be the cost of reprocessing them so that they fulfil some or all of the system's objectives? Perhaps educational efficiency is analagous to industrial efficiency in that it can be increased continually by reprocessing the system's apparent wastage.

The discussion of pupil-retention focussed on increasing the denominator of the input-output relationship, thereby reducing unit costs and raising efficiency. But leverage can also be exerted on the numerator—reducing costs of inputs and number of inputs required per unit of output. Lower cost means of providing and utilizing the educational plant must be found. The scope of influence of teachers and instructional aids must be extended. And the education process must experiment with new combinations of inputs which result in larger numbers of students being educated with substantially the same inputs.

The cost of teachers is a crucial element in the overall cost of education, comprising 70–80% of total costs at the lower educational levels and frequently 50% at the highest levels of professional education. Hence, research and experimentation into ways of increasing the productivity of teachers deserves the highest priority. Moreover, the demand on the part of teachers for increased salaries, and the apparent need for higher salaries in order to attract more educated persons into the teaching profession, imply steadily increasing costs for teachers. If the educational system is going to improve its internal cost efficiency, or even maintain its present level of efficiency, it must insure that the productivity of teachers rises commensurately with their salaries. The teachers must justify their wage through improved qualifications which enable them to teach more effectively—to more students than previously or to the same number of students in a better fashion, by working for longer hours each day or more working days per year, or by mastering new instructional techniques, etc. At the same time, the educational system can increase the effectiveness of its teachers by providing them with improved instructional materials and aids, supporting them with teaching assistants, offering them opportunities in evenings and vacation periods to improve their skills.

Summary

Economic criteria are decisive tools in educational planning concerned with:

- *a.* The relative desirability of an educational project vis-a-vis non-education projects;
- *b.* the relative desirability of two different approaches to solving a particular educational problem;
- *c.* improving the internal efficiency of the educational system, or any one of its sub-systems.

Several conceptual problems must be resolved in applying economic criteria to each of the decision areas. They constitute the immediate research needs in the field of economics of education.

- *a.* How should the objectives of educational sub-systems be defined? How do the objectives vary among different educational levels?
- *b.* What parameter should be used as the basis of unit costs? Should it be the completer of a sub-system? Or average daily attendance? How should the parameter change depending on the educational sub-system being considered?
- *c.* In comparing input-output relationships of educational sub-systems, how can quality be standardized? In general, how does one treat sub-systems with differing quality of instruction and output?
- *d.* How should output and unit costs be adjusted to reflect the problem of drop-outs and failures? What are the costs necessary to retain these students in the educational system? What are the costs of achieving the objectives of the sub-system they have left through remedial and special programmes outside that sub-system?
- *e.* How can the productivity of various educational inputs be measured? What innovations in management, technology, or physical plant are needed to improve productivity? In particular how can the effectiveness of teachers be extended to reach more students, without deterioration in quality of instruction?

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Chapter Eighteen

Economic Analysis and Planning of Education Industry

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With an increasing emphasis on the economic benefits of education, in recent days, in the discussions on educational development in the country, it is natural that a more materialistic view is taken of the education process itself. Several attempts have been made to calculate the rates of return of educational expenditures in different countries. Attempts have also been made to compare the rates of return of educational investments and investments in material capital, to assess the over or under-investment in the institutions providing education which have been following some of the tools that manufacturing industries employ for raising their efficiency. The rates of return calculations, unit cost calculations, balance-sheet concepts, income and expenditure statements, etc., are some of the concepts popularly used in the educational sector. Some educational institutions in advanced countries (U.S.A. and U.K.), for instance, have even started business offices, which function more or less like the business management offices of the manufacturing industries. Some economists have suggested that the pricing principle (in assessing fees) in educational institutions should be similar to the pricing principle in manufacturing industries.[1] All this would suggest that education can also be considered as a business or an industry.

Educationists (who are already involved in a duel with economists for their expansionist trend towards education) would certainly frown upon this view of considering the pure field of education as an industry. It must be clarified at the outset that the epithet of industry to education in no way means that the schools and colleges are or should be essentially profit making institutions like other industries. Though the existence of the objective of self-sufficiency may not be ruled out for the educational institutions, they do not generally keep the motive of commercial profit maximization. The educational institutions are basically ' spending institutions ' unlike the commercial enterprises.[2] The measure of efficiency for the commercial enterprises is the rate of profit that is earned. But the same cannot be said for the education industry. The measurement of productivity in education industry hinges on the problem of the measurement of its output (and of inputs) which is intangible and multi-dimensional. However, it has to be examined whether the tools employed by the industries can be fruitfully used for better management of education. It is with this end in view that one may call education an industry. Before the efficiency tools of commercial firms, are applied, it is necessary to consider the outstanding features of education as an industrial enterprise. The objective of this paper is to analyse the features of education as an industry and examine its planning problems. In the first two sections of the paper, an attempt is made to consider the important features of education industry with special reference to its relation with employment problem in the country. In the section that follows, some suggestions are made for the planning of investments in education industry.

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[1] S. E. Harriss, *Economic Aspects of Higher Education.*

I. Education as an Industry: Similarities and Peculiarities

Education has been given the epithet of industry, because it produces the manpower of different skills and efficiency for the production process of the economy. Whereas, the products of the other industries are valued for their usefulness in the production or final consumption, the product of education is valued for its productivity—in the production process. That is why Marx calls the schools as ' teaching factories '. As stated above, it is not true to say that all industry concepts can be meaningfully employed for the analysis of education as it has its own peculiarities.

a. Production Function for the Education Industry

Unlike other industries, education industry's output as well as inputs are not clearly identifiable and measurable. Socio-economic and psychic factors abound in case of both inputs and outputs. However, the major and obvious components of this production function are students' time and effort, teachers' time and effort, books, teaching materials and other equipments. Educational level in general, and educated manpower in particular, is the output of this industry. Mathematical formulation of this industry, production function is complicated because of the difficulties involved in identification and measurement of all of its components. However, some general observations may be made on the peculiarities of this production function.

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[2] Russell, *Financing of Higher Education*, p. 46.

Elasticity of substitution between different factors of its production function is very low. Buildings cannot be substituted for teachers, and obviously teachers' effort cannot be substituted for students' effort, and so on. Substitution of teachers by modern teaching machines is possible only in a marginal way. Mechanization of education is a remote possibility, as even the modern equipments require the labour of more teachers.

This industry uses human capital intensively and produces human capital. One can say that it is engaged in the 'production of human capital by means of human capital'. It uses the largest number of skilled manpower. That this is so is borne out from the following Table.

TABLE 1

RELATIVE EMPLOYMENT OF EDUCATED PERSONS IN EDUCATION INDUSTRY AND MANUFACTURING INDUSTRIES IN INDIA

S. No.	*Percentage of Educated to the Total Employed in* *Education Industry (Around 1960)*	*Manufacturing Sector (Around 1958)*
0	1	2
1.	96·4%	12·1%
2.	91·5% (only teachers)	

The estimates of total number of people employed in education industry are presented in Appendix Table 1.

Educated people in education industry are teachers and administrative staff. In manufacturing sector (factor industries), employees other than workers are supposed to have higher qualifications.

In education industry production is very cheap. Educational institutions do not make demands on the scarce resources of the economy. In most of the developing countries, the required manpower is abundant. There are constant additions to the student population. The supply of teachers can be considered a scarce resource in some countries; but this scarcity can be eliminated at least in the long run by proper organization of production in the education industry itself say, by way of suitable planning of curricula and wage and salary structures. The other main demand which education makes upon an economic system is in the supply of buildings and equipments. These (buildings in particular) can be provided mostly from the indigenous material and at low costs also. The equipments used in the education industry are generally not very costly like those in manufacturing industries.

Foreign exchange component of education is very low. This industry may at the most demand some foreign exchange resources for foreign teachers, textbooks and sophisticated scientific equipments. Even in the higher branches of education, this may amount to not more than 5 per cent of the total direct costs of education. It is thus clear that production in education industry demands very small amount of domestic as well as foreign resources. In view of the strategic importance of the output of this industry, education represents the easiest and a significant form of developmental expenditure which can be undertaken by a poor country.

The size and cost relationship for education is quite comparable with that for the commercial firms. Firms have U shape cost curves indicating falling unit costs upto a certain level of output (optimum) and rising unit costs after that level. The evidence in case of a firm in the education industry (*e.g.* Bombay University) supports the hypothesis that per student recurring and instructional expenditures generally vary inversely with the size of the educational institution.[3] This may suggest that the economies of large scale production work in case of education industry also.

As manufacturing industries progress, they become more (material) capital intensive and less labour intensive. This is a general observation in their case, as machines take over the work of men. But in case of education, machines cannot eliminate manpower. Progress in education industry in fact means a higher teacher-pupil ratio indicating greater individual attention.

Some peculiarities can be observed in case of the rewards that the strategic factors receive in the education industry. The strategic factors of production in the commercial enterprises are paid highest rewards, *e.g.*, managers, engineers, and administrative officers etc., are highly paid. But in education industry, the most strategic factor—teachers—generally receive low rewards as compared to their counterparts in other industries. This may be partly due to the low skills of the present teachers, but it is mainly due to the neglect of the long term value of the output of this industry.

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[3] See the data in the *Appendix*. But this evidence does not indicate the rising average expenditures for the increasing size after the optimum size is attained. Perhaps, the optimum size is not attained as yet in the firm under consideration.

b. Education as a Stable Business

The commercial firms are subject to the vagaries of time. There are fluctuations in their fortunes. On account of several factors there are, what are known as business cycles. But the same cannot be said in case of education industry. It can grow without serious disturbances. The effective demand for its product (though not clearly identifiable and measurable) grows on continuously over time mainly for two reasons. Firstly, population is growing continuously, and consequently there is a continuous addition to the student body. Secondly, as education expands in the economy, there will be greater demand for more education. To use Burton Weisbrod's terminology, there is an 'Option effect' of education for still higher education. Further, the Duesenberry demonstration effect works in case of the consumption of education also. The uneducated try to copy the educated by receiving more education.

The consequences of this fact of undisturbed growth of demand for education is that investment and employment in education industry also grow continuously over time. But it must be noted however, that demand, investment, employment etc. do not grow unevenly in education industry as in manufacturing industries. All of them grow very steadily. This contrast is made clear in Tables 2 to 4.

TABLE 2

EMPLOYMENT IN EDUCATION IN INDIA

S. No.	*Year*	(000)	*Index*
0	1	2	3
1.	1950	870·9	100·0
2.	1951	925·3	106·2
3.	1952	971·2	111·5
4.	1953	1035·7	118·9
5.	1954	1117·8	128·3
6.	1955	1199·7	137·7
7.	1956	1268·9	145·6
8.	1957	1337·0	153·5
9.	1958	1423·1	163·3
10.	1959	1531·2	175·8
11.	1960	1643·9	188·7

Note: Employment in education is estimated as the sum of the total number of teachers, administrative personnel, lower level staff.

TABLE 3

TOTAL EMPLOYMENT IN MANUFACTURING INDUSTRIES IN INDIA

(Census of Manufacturers)

S. No.	*Year*	(000)	*Index*
0	1	2	3
1.	1950–51	1632	100·00
2.	1951	1633	100·06
3.	1952	1642	100·60
4.	1953	1621	99·30
5.	1954	1715	105·10
6.	1955	1784	109·30
7.	1956	1886	115·50
8.	1957	1896	116·10
9.	1958	1821	111·60

TABLE 4

EDUCATIONAL INVESTMENTS IN INDIA

(Educational Capital)

S. No.	*Year*	*Index*
0	1	2
1.	1950 51	100·0
2.	1951–52	111·2
3.	1952–53	120·3
4.	1953–54	129·1
5.	1954–55	141·0
6.	1955–56	156·3
7.	1956–57	168·8
8.	1957–58	185·5
9.	1958-59	204·9
10.	1959–60	225·3

SOURCE: 'Educational Capital in India,' *Indian Economic Journal*, January-March, 1965.

Stability can be observed in case of the structure of the education expenditures also. For example, instructional outlays are generally a major portion of the total expenditures. They were so in the distant past as at present. In the United States, which has made great progress in recent times in design and installation of the instructional equipment and school buildings and other non-instructional factors, a study of the expenditures indicates that over the last several decades the ratio of instructional expenditures to total expenditures on education has remained constant. 'The average school in 1890 spent about 90 per cent of its outlays on buildings and educational equipment on building itself. The ratios are apparently about the same for schools in 1960's '.[4]

In a striking contrast to this, the structure of the outlays in the manufacturing sector is always subject to frequent changes. About 75 per cent of the total building and equipment outlays were devoted to the building by the manufacturing industries in 1890 in the United States. The remaining 25 per cent was spent on machinery and equipment. But in the 1960's the equipment outlays were 75 per cent of the total outlay, whereas 25 per cent of the outlay was on the plant (building) itself. This is exactly opposite of what was observed in the 1890's.[5]

The stability of the structure of the educational outlays is mainly due to the fact that the basic technology of education does not get changed frequently like the one in manufacturing industries. The simple tools like blackboard, chalks, books, maps, etc., are the basic requirements in education. The changes that can be observed here are marginal. At the most, the size of the class may reduce, finer qualities of chalks, papers, blackboards, etc., may be used. But in the manufacturing sector, the innovations of better techniques may disturb the cost structure very much. Though in education industry also, innovations of better techniques cannot be ruled out, the changes will not involve a conspicuous reallocation of the outlays.

The above discussion would bear out that 'education clearly is not one of the unstable sectors of the economy'.[6] On the other hand, investments in education are generally used as an anti-cyclical instrument. The Governments in some countries have spent during the last depression substantial amounts on construction of school buildings, and expansion of educational facilities, as a policy measure to boost the effective demand in the economy.

c. *Some Other Features of Education Industry*

Outlays in education industry are generally less liquid than other investments. Liquidity of outlays is a phenomenon due to the fact that material or financial investments may be more or less fluid, so that they may be withdrawn with less difficulty. Current banking accounts for example, are more liquid, but investments in shares are less fluid. Investments in education are still less liquid according to this definition of liquidity. For, if people are employed in a profession, wherein the education that they have received is not directly useful, then the funds invested on their education cannot be withdrawn. Such investments are frozen in these people.

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[4] Burkhead, J., *Public School Finance*, p. 80.

[5] J. Burkhead, *op. cit.*, p. 80.

[6] T. W. Schultz, *Economic Value of Education.*

A comparison of the education industry with the banking industry will be more fitting. Both use capital for their business; one uses financial and physical capital and the other predominantly human capital. A deposit of some human resources in this industry will transform their nature in due course of time. The longer the period for which human resources are effectively deposited[7] in this industry, the higher will be the reward on the deposits (interest) in the future, by way of higher skills and productivity and higher employability and earning capacity. Like the banking industry, education industry not only accepts deposits and transforms their nature, but it also supplies capital. It is a great reservoir of human capital. The economy can withdraw this human capital of different skills for production purposes.

The output of this industry is highly differentiated. The substitutability of one technical graduate with another is limited. For, there is a differentiation and gradation in the knowledge of the educated people. (Otherwise, there would not have been the need for interviewing different graduates before employing them.) Sources of differentiation can be in general: differences in quality, ignorance of buyers regarding the essential characteristics of the product, and persuasive sales promotion activities of the sellers.[8] All of these three factors may be responsible for the differentiation of the product of this industry. Genuine quality differential, or the possibility of being led away by the rank or class obtained in the examination, or the dynamism or drive and extraordinary social relations may lead to the tendency of employers (buyers of the product of education industry) to differentiate between persons with the same educational level.

Similarly the specificity of this industry with regard to some of its factors is very great. It would accept and retain for transformation only those people who would satisfy certain minimum prerequisites with regard to ability and aptitude. For example, a person with no aptitude for subjects like mathematics, will not gain much by education in those subjects and would soon be eliminated.

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[7] Note that human resources should be effectively deposited, to earn returns. This rules out the possibility of higher returns to the dullards who fail every year and thus remain in education for long. In their case, there is no effective participation in education.

[8] Bain, *Industrial Organization*.

It is interesting to compare the nature of development and location of other industries with that of education industry. The main features of industrial development in certain developed countries are away from agriculture, toward localization of certain industries and toward urbanization.[9] The same is true of the development of education industry. Generally a majority of the educational institutions are situated in urban cenrtres and they provide the manpower mainly for non-agricultural enterprises. This concentration of educational institutions may be mainly due to the demand factors.

Education industry has very close links between the firms within itself. Primary education, for example, directly affects secondary education. Higher education depends on the secondary education and so on. For this reason, the planning of the industry as a whole will have to depend upon the planning of these sub-systems.

Planning and development within the education industry have a strong bearing on the economic development of the country as a whole. It is through the effects on labour productivity that contributions of education industry to the economic development are observed. One can say that this industry's impact on the long-term development of the economy is more significant than that of any other industry. Its influence on the skills of labour and hence employment situation in the country is of great relevance to the overall development policy.

II. EMPLOYMENT IMPACTS OF EDUCATION

The close link between education and employment, though generally neglected, is one of the most significant features of education industry. The present section proposes to consider in some detail, the employment impacts of education industry with a particular stress on its measurement procedures.

a. Education as an Employing Industry

In any industry larger expenditures will generate in general, greater employment opportunities within the industry itself and outside the industry also. This is more true in case of education which is a highly human capital intensive industry. It employs a large number of teachers to train the growing number of students. It also employs people as administrators, office superintendents, librarians, clerks, stenos, peons, etc. In other industries, increase in expenditures may not necessarily mean larger employment of labour and that too of skilled labour. More funds may be used for the purchases of raw materials, of machineries which use less labour and so on. But in education industry larger expenditures necessarily mean larger employment, especially of the people of particular types of skills. Mechanization of this industry is of a relatively remote possibility.

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[9] Florence, *Economics and Sociology of Industry*, p. 59.

The number of people employed in this industry at a particular time can be obtained by summing up the number of employees in all the formal educational institutions and in all the official and non-official bodies looking after the educational matters in the country. This total gives the figure of employment in formal educational activities. But there are many types of education other than formal education; for example, education at home, education in the industries (on the job training), education in the religious institutions, education in the armed services, etc. In case of education at home, we have to consider the number of private teachers or tutors. (Mothers may not be considered as employed to train their children!) The number of pandits, or teachers in the religious institutions, earning only from their teaching, may be quite substantial in countries like India. Similarly well-organized industries employ supervisors and teachers to provide on the job training (either formally or informally) to their employees. Training in the military science involves the services of a good number of trainers and experts. Employment in all these sectors will have to be considered, therefore, to know the employing capacity of the education industry as a whole. But, for the present, due to data limitations, we will limit our consideration to the employment in formal education only.

It has been estimated that formal education in Ghana employed 25,000 people, in Nigeria over 100,000 people and in the United States about 25,00,000 people around 1960's.[10] In India, about 16,44,000 people were absorbed in the education industry in 1960-61 (see Appendix Table 1).

It has been observed that education employs more persons than manufacturing, transport and public utilities in the developing countries of Ghana and Nigeria. In India, education is employing half the number of persons employed in the manufacturing sector. However, the number itself is quite substantial.

Job creating capacity of the education industry and other industries can be assessed by comparing their expenditure employment ratios. It can be seen from the following Table that expenditure required to employ one person is more in other industries than in education industry.

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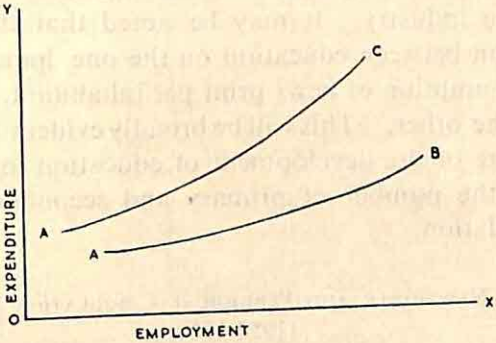
[10] F. Harbison and C. A. Myers, 'Education and Employment in the Newly Developing Countries,' *Comparative Education Review*, June, 1964.

EXPENDITURE EMPLOYMENT RATIOS

S. No.	*Year*	*Education (in Rs.)*	*Manufacturing Sector (Factories) (in Rs.)*
0	1	2	3
1.	1950	1,305·88	...
2.	1956	1,619·39	...
3.	1959	1,862·90	8,260·6
4.	1960	2,088·30	9,543·4
5.	1961	...	10,660·6

In the following figure, the curves AB and AC represent the nature of expenditure employment relationship in education industry and in other industries respectively. The slope of the curve for education is lower than for other industries.



It has been observed above that education industry is more human capital intensive unlike other industries, which as they grow become more and more material capital. It can be said therefore that per unit of material capital also employs more people in education industry as compared to other industries.

Indirect Employment Impacts

So far we have considered only the direct employment effects of education. They consist of a rise in employment in education sector only. But education has indirect employment effects also. For example, expenditures in educational sector are made on many items like paper, printing, stationery etc. These expenditures are continuously growing over the years. Hence the industries producing the goods and services for the education industry will get a stimulus to continue their production on a large scale. This in its turn may induce still other industries to produce the requirements of the second type of industries and so on. Therefore, there are what are known as linkage effects on production. Production is stimulated in the whole industrial structure through multiple effects. Since production is stimulated, employment in the whole industrial structure may also go up. This is the indirect employment effect of education.

Though in the total inter-industrial relations, education industry's role may be small, its importance is certainly significant when we consider some industries which are in the main dependent upon the activities of the education industry. Paper industry can be cited as an example. This industry supplies a significant portion of its product to the educational institutions by way of writing paper, books etc.

Further, educational institutions produce more and more educated people. Educated people, with greater liking for three R's act like intermediaries in affecting paper and printing industries. They demand more books, more newspapers etc., thus there is a long term multiplier effect on output and employment in other industries due to the activities of the education industry. It may be noted that there is generally a strong correlation between education on the one hand and newspaper circulation, consumption of news print per inhabitant, and circulation of periodicals on the other. This will be broadly evident from the following Table. The state of the development of education industry is indicated by considering the number of primary and secondary school teachers per 10,000 population.

Indices of Newspaper and Periodical Circulation and Teachers (1950-1960)

S. No.	*Country*	*Primary and Secondary School Teachers per 10,000 population*	*Newspapers: Estimated total circulation per 1,000 inhabitants*	*Consumption of Newsprint per inhabitant (Kilograms)*	*Periodicals other than general interest newspapers Estimated circulation per 1,000 inhabitants*
0	1	2	3	4	5
1.	Kenya	31·6	6	0·4	40·47
2.	Nigeria	25·7	8	0·1	11·29
3.	Afghanistan	3·3	5	*N.A.*	*N.A.*
4.	Indonesia	29·4	11	0·2	33·92
5.	Iran	24·6	5	0·4	6·65

INDICES OF NEWSPAPER AND PERIODICAL CIRCULATION AND TEACHES (1950-1960)—*Contd.*

S. No.	*Country*	*Primary and Secondary School Teachers per 10,000 population*	*Newspapers: Estimated total circulation per 1,000 inhabitants*	*Consumption of Newsprint per inhabitant (Kilograms)*	*Periodicals other than general interest newspapers; Estimated circulation per 1,000 inhabitants*
0	1	2	3	4	5
6.	China (Mainland)	24·0	20	*N.A.*	23·92
7.	Malaya	69·2	34	0·7	*N.A.*
8.	Pakistan	20·2	9	0·1	*N.A.*
9.	India	30·2	11	0·2	42·82
10.	Cuba	36·6	129	5·0	311·88
11.	South Africa	45·6	61	4·9	*N.A.*
12.	Italy	69·9	103	4·9	*N A.*
13.	Denmark	60·5	357	18·3	1,517·04
14.	West Germany	49·3	313	8·6	*N.A.*
15.	U.S.S.R.	65·2	160	1·6	3,327·40
16.	Canada	88·9	232	24·4	867·79
17.	France	69·7	243	10·6	2,543·52
18.	Japan	75·3	398	7·3	*N.A.*
19.	U.K.	64·2	582	22·1	*N.A.*
20.	Australia	62·1	380	27·9	*N.A.*
21.	U.S.A.	135·1	328	36·1	2,205·60

SOURCE: F. Harbison, and Chanler A. Myers, '*Education and Employment in the Newly Developing Economies*' (Mimeographed).

Therefore, this long-term indirect impact of education industry on the employment in other industries should be quite substantial. Though this type of long term employment effect is difficult to measure the inter-industry multiplier effect of educational expenditures on output and employment can be measured with the help of the input-output technique provided the relevant data available are sufficiently exhaustive.

Education Industry and the National Employment Problem

We have seen above that education industry has a significant amount of employment potentials. Also, that the employable human capital generated would have great impact on the employment situation in the country. Employment opportunity for the educated is generally higher than for the uneducated. Similarly, the employment opportunity for the educated goes on increasing as the level of education (upto a certain level, as the market for the highly specialized labour is limited and the law of diminishing returns works in case of education also).[11] But, at the same time, education is supposed to have contributed to the employment problem at the national level by increasing the seriousness of the problem of educated unemployment. Though, at the individual level, education helps to solve the employment problem, at the national level it may not. An important reason for the educated unemployment is that the educational system is not geared to the needs of the economy. Though this is a relevant factor, more serious factors for the employment problem are twofold: (*a*) Educated persons in most of the developing countries do not accept jobs even if they are available, because, they consider these jobs to be below their dignity especially when they involve some amount of manual labour. This, we may call as voluntary unemployment among the educated. (*b*) But, there is another reason, which is more serious in under-developed countries viz. lack of effective demand for labour as a whole and for the educated personnel in particular. This may be because of (i) blind following of the techniques of production of the advanced economics, which are more capital intensive rather than labour intensive, (ii) low incomes in general, and (iii) employment of unskilled labour which is available on very cheap wages. In the second case, above, educated persons are prepared to accept any type of employment, but employment opportunities are limited. Hence, this may be called the involuntary unemployment of the educated.

Most of the developing countries face the latter type of educated unemployment problem. The fact that mainly low income and not education causes unemployment can be better appreciated in the setting of classical economics. In the static situation (in which most of the classical theories were developed), increased productivity means higher wages, but fall in employment, as wage fund is held fixed. But once we bring in dynamic aspects of the growing wage fund itself, increasing productivity may be accompanied by a rise in wages as well as in employment. Education itself may be partly responsible for the rise in wage fund. Thus, along with its impact on individual productivity and earnings, education contributes to employment also.

Apart from creating more suitable manpower for the economy, a properly planned education industry helps to ease the employment problem. Let us consider a situation, where the problem of unemployment is very severe as is the case in many developing countries. Let us imagine that education industry completely closes its operations. Then it would be evident that consequences of this on the employment situation of the country would be extremely serious. All the erstwhile students would flood the labour market, bringing about a serious confusion in it and in the wages. Education detains many people within itself and prevents them from bringing about this chaos. Hence, this alternative effect of education on the employment situation of a country is very important. This impact of education on employment can be measured by considering the total number of students above fourteen years of age (who are not employed at the same time) who are held back from entering the labour market. Though here education has an unfavourable effect on the employment from the point of view of an individual, the total effect is certainly favourable from the point of view of employment in the economy as a whole.

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[11] See, for example, P. Strumilin 'The Economic Significance of National Education' in *Economics of Education*, Robinson and Vaizey (ed.), p. 319.

Education gives greater incentive for rural urban migration. This will have very significant influence on the productivity in rural agriculture. We know that productivity in agriculture is low and there exists disguised unemployment. If education paves way for the migration of some people who are in excess, from the agriculture sector, then the problem of disguised unemployment and low productivity might become less serious.

Education raises the incomes of the people, and consequently the total expenditure in the economy increases. With an increasing consumption of goods and services, the inter-industry linkage effects create larger employment outlets in the economy (assuming the adjustments in the supply of other factors). Long run employment impacts may work through the saving abilities and thrift motives and a result of increased incomes through education.

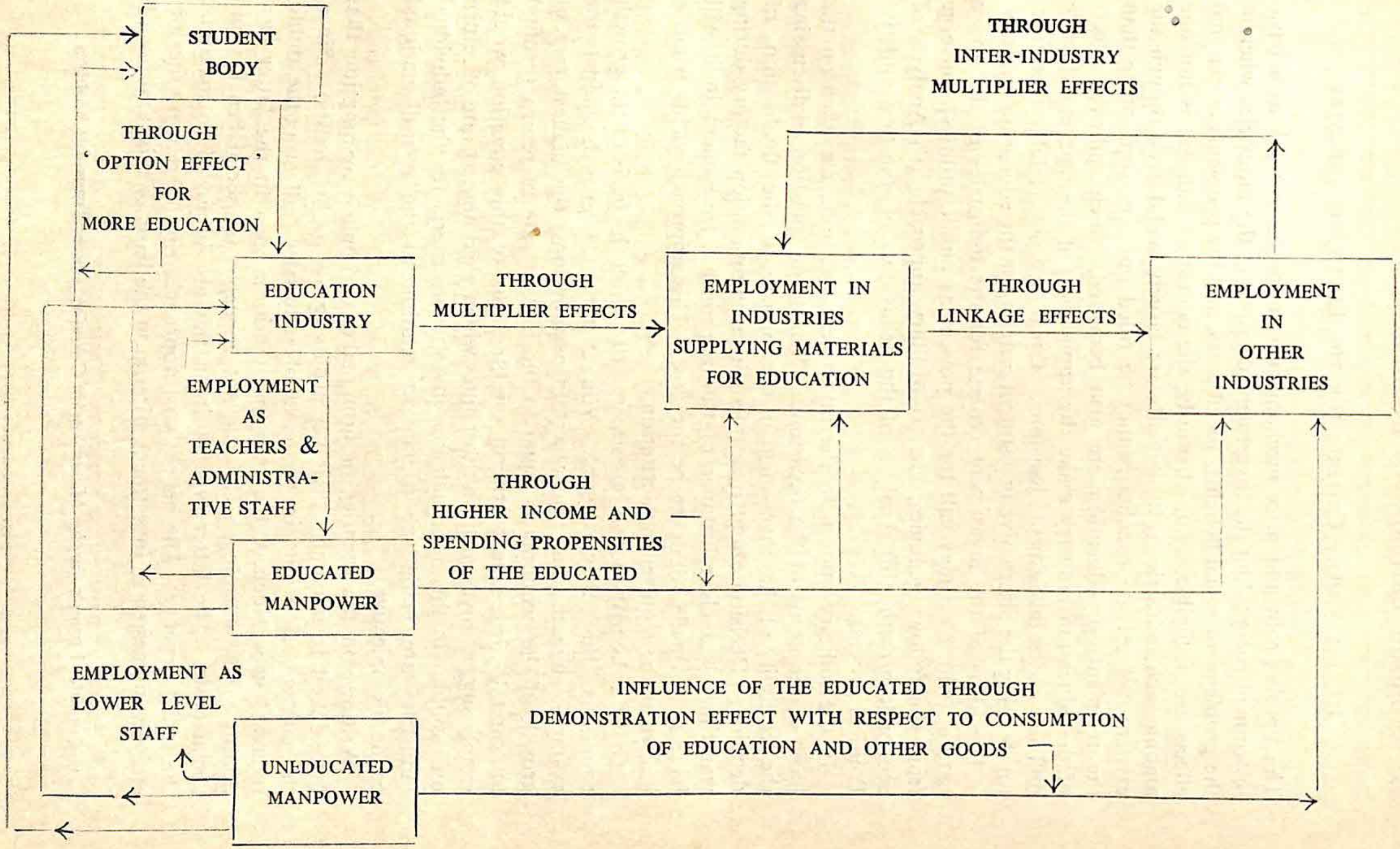
Education alters not only the volume of consumption, but also the structure of consumption in the society. Educated people develop tastes for novelties and hence production of such goods gets stimulated. Consequently, the structure of employment in the economy is altered as a result of education.

With the expansion in education facilities, and through the working of the ' option effect ' and demonstration effects of consumption of education on the uneducated people, the proportion of population going in for education, rather than for cheap jobs, increases. This, therefore, brings about a fall in the supply of particular types of labour. The supply of domestic servants, for example, has been falling these days. Educated people would rarely go in for such jobs. The pattern of employment is therefore altered through this channel also.

Education acts as an agent for redistribution of earning power and actual earnings in the economy. Consequently, this will be reflected in the redistribution of employment opportunities. Rigidity in the labour market might get reduced as a result of education, and labour may become more mobile. Frictional unemployment would, therefore, become a less serious problem with expansion of education.

It may be observed that measurement of all these impacts of education on employment is a difficult problem. For, these impacts have an uncertain time dimension and education is one of the many major factors that cause them and all of them are interconnected. However, understanding of the importance of education in the process of employment generation would help the planning of development in general and of education in particular. The following flow-chart presents a schematic picture of the flow of the employment impacts of the education industry that we have considered in this section.

A Flow-Chart of the Employment Impacts of the Education Industry


STUDENT BODY
THROUGH ' OPTION EFFECT ' FOR MORE EDUCATION
EDUCATION INDUSTRY
THROUGH MULTIPLIER EFFECTS
EMPLOYMENT IN INDUSTRIES SUPPLYING MATERIALS FOR EDUCATION
THROUGH LINKAGE EFFECTS
EMPLOYMENT IN OTHER INDUSTRIES
THROUGH INTER-INDUSTRY MULTIPLIER EFFECTS
EMPLOYMENT AS TEACHERS & ADMINISTRATIVE STAFF
EDUCATED MANPOWER
THROUGH HIGHER INCOME AND SPENDING PROPENSITIES OF THE EDUCATED
EMPLOYMENT AS LOWER LEVEL STAFF
UNEDUCATED MANPOWER
INFLUENCE OF THE EDUCATED THROUGH DEMONSTRATION EFFECT WITH RESPECT TO CONSUMPTION OF EDUCATION AND OTHER GOODS

III. INVESTMENT CRITERIA FOR THE EDUCATION INDUSTRY

The simple profit and price mechanism is supposed to work as a basic instrument for guiding the investment decision in the industries wherein the problems of social benefits, social costs, and the problems of external effects are negligible. But obviously, the education industry is not one among such industries. Its benefits are largely social even though the existence of private benefits cannot be ruled out. Persons other than the recipients of education are also benefited. Such spillover effects of the education industry make the application of the market principle difficult in its investment decisions. Great urgency is felt, therefore, for devising the alternative investment criteria for the education industry.

The ideas of the investment criteria for the industries of the above nature, (which we may call for the present as public utilities) converge from the following angles, viz. (i) Military approach, (ii) Analysis of economic growth, (iii) Analysis of the behaviour of the firm and (iv) Political process.

In the military approach, the investment decisions are taken on the basis of the needs of the occasion. There is no question of discussing the feasibility of the investment in the process of the finalization of decision. Decision about investment in an ammunition factory during war times is a clear instance of this approach. Investment in it will have to be made whatever be the cost. This approach yields what is known as the requirements criterion.

Growth theorists derive investment criteria on the basis of the growth equations, that they suggest. Von Neumann's growth model for example, suggests that under certain assumptions, the highest rate of growth of the economy is equal to the highest rate of return (profits) on capital. Investment criteria on the basis of this equation would simply suggest investment in those lines which yield highest rate of return on capital. In this approach, the investment criteria for the individual industries are made subordinate in relation to the overall national economic objective.

Writings on the theories of firm make an implicit assumption that firms invest to maximize their net profits (gross profits—costs). Since, the concept of profits in the case of industries 'affecting the public interest' gets widened, the investment criteria also in the latter case attains a new meaning. The relevant concepts are social benefits and social costs. The latter type of industries are supposed to maximize the social benefits. The benefit cost approach, rate of return criterion, etc., are suggested as investment criteria on the basis of this approach.[12]

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[12] Consider Foster's *Surplus Maximization Criterion*, Foster Transport Problem,

The votes maximization[13] (the political process) is recommended as a tool for decision making for investment in the democratic set up. This approach may indirectly incorporate the basic ideas of the other approaches, but at the same time, it demands a great sense of responsibility and ability of the voters.

Which of the above approaches will be useful in the planning of educational outlays? Before delving on this problem, it is worthwhile to consider the different types of educational outlays. Investments in education by the institution can be broadly distingusihed into the following types:

i. Outlays on buildings of schools, hostels, libraries etc.
ii. Outlays on administration and equipments (transport facilities, administration etc.)
iii. Purely educational outlays like expenditures on teachers' salaries, scholarships, books, laboratory facilities etc.

The present literature on education and investment criteria, deals with the entire educational outlays without making a distinction between different types of outlays. This will not yield meaningful investment criteria as will be clear presently. Though different types of educational outlays are very closely interrelated, one type of investment criterion quite useful in case of one type of outlay may not be useful in case of another type. For example, benefit cost techniques derived from the analysis of the firm behaviour can be meaningfully employed in decisions with regard to outlays on school buildings, hostels, or library buildings etc. wherein the calculation of the benefits and costs is not very difficult. The benefits from building can be approximated by the capitalized market value of the building over its life time, and the cost is obviously the construction cost plus the maintenance costs over time. The requirements approach is also useful to some extent in case of investment decisions on buildings and equipment as the minimum space requirement per student will have to be satisfied whatever be the cost. These approaches may not be very much useful in case of purely educational outlays. The identification and measurement of the benefits and costs of the purely educational outlays is hardly easy. The application of the usual benefit cost technique in their case can at the most be partial.

The reasons for the nonapplicability of the benefit cost technique in decision making for purely educational investments can be briefly stated as follows:

1. *Identification and Measurement Problem.* The benefits and cost of education are innumerable. There are intangible benefits, spillover

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[13] See Anthony Downs, *Economic Theory of Democracy*.

benefits, and intergeneration benefits. To consider only the earnings as the benefit of education may underestimate its importance a good deal. Further, the primary purpose of educational expenditure is lost sight of in this process of estimation of the earnings benefit of education. The primary purpose of investment in education is to raise the educational level of the society, to develop the cultural faculties of the people, and to create more civilized, decent, and useful citizens for the future. Obviously, income cannot be the measure of all these. Monetary transformation of the educational level is not possible either. It is not desirable also. On the cost side special problems will have to be faced such as whether opportunity costs in the form of foregone earnings should be considered or not. Measurement of both benefits and costs would involve many assumptions and hence may invite dis-agreement.

2. Even in the partial application of the benefit-cost-technique, there are difficulties of choice of interest rates in finding the current values of the series of benefits and costs, the problems of interpersonal and intertemporal comparisons of utility of education, the problem of aggregation of individual benefits and costs to get the national figure, the problems of uncertainty (which are abundant in case of education, for example, there is uncertainty about the adoption of the present teaching techniques in the future, uncertainty about the continuation and completion of the course by the students about the choice of the courses etc.) etc. This is not to suggest that this technique should be completely dispensed with in case of education, but it is certainly true at the same time that if unaided by other tools, this technique alone cannot give the meaningful decisions in the planning of purely educational outlays. The rate of return criterion based on the life time differential earnings and costs of the educated people, it may be noted, does not give an exact basis for the national decision on educational investment. At the most it can give some idea about the direction: invest more or invest less. It is essentially a decision principle for the individual as it is based on the estimates of individual earnings. The manpower planning derived from the growth angle which is generally suggested as a planning device for national educational investments can be considered a suitable method for planning of purely educational investments from the point of view of the growth needs of the country, if it is possible to estimate the future manpower requirements in the different sectors. This approach can give the signals both for direction and magnitude of investments in education.

One can view the different investment criteria as complementary in educational planning.* For instance, the manpower approach, rate

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*See for an approach towards this direction, M. Blaug, 'Aspects of Educational Planning', *Economic Journal*, June, 1967.

of return approach and the simple analysis of benefits and costs (*i.e.*, just description and measurement of benefit and costs) together may all be useful in the decision process. The manpower approach would give the basis for the estimates of the enrolments in the different lines of educational system. This gives a forecast of demand and of supply in the education system in an aggregate sense. But who will enter what line of education is not still decided. This will be decided by the individual calculations of the costs and returns of the particular line of education. Since, the costs of training in various types of specialized manpower differ quite significantly, the consideration of the differences in earnings in relation to the differences in costs becomes quite significant. Students' aptitudes also are relevant considerations apart from the above monetary factors in the individual choices of the lines of education. The rate of return approach which consists of the comparison of the monetary returns (earnings) in relation to the costs, would help in the individual decisions of choosing the different lines of efficiency training in the broad framework of manpower needs. It may be noted that the above two approaches consider only materialistic aspects of education. A simple analysis of benefits and costs, (not benefit cost technique which has a special meaning) would come to fill in this lacuna. It is supposed to present a ' long and a wide view ' of the consequences of the present plan of education obtained with the help of the previous two approaches. If the costs outweigh the benefits, then a modification may be attempted in the educational plan. The analysis of benefits and costs may involve subjective assessments, and consequences of this will be reflected in the ultimate decision also. Thus, whereas the firm's approach is more relevant for the outlays on buildings, equipments and administration, growth approach is more relevant for the purely educational outlays.[14] In case of the latter, a combined criteria of manpower forecasting, rate of return and simple analysis of benefits and costs, can be fruitfully employed in investment decisions. Obviously such decisions in a democratic set up are to be taken by the people in general and elected parties in particular. It is these responsible organs that do all the assessment of different types of investments on the basis of the above criteria. Since subjectivity has a place in such assessments there would be different views regarding size and allocation and to arrive at an ultimate decision the voice of the majority will be valued. In this sense, political process or votes maximization principle comes as a tool of decision making rather than as a basic principle of decision making.

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[14] We do recognize the interdependence of the decision with regard to different outlays. Therefore, it is suggested that the decision process should be based on the co-ordination of different criteria, but at the same time, an approach making no distinction between different types of outlays and applying a single investment criterion to all, will not be correct.

Operations Research Approach to Educational Planning

The undercurrent of the above discussion is that different investment criteria are useful in different types of investments in education, and that for an overall planning of education, a complementary use of all the criteria is necessary. Some technique of operations research may point the way to joining of the different approaches. Such techniques become indispensable especially when we have to take an overall quantitative view of the development of education. The input-output technique can be used in planning the enrolments in various stages of education. The planning of national education can be divided into planning at different chunks according to the levels. The systems analysis which consists of obtaining an efficient national plan on the basis of the plans at sub-systems (chunks) can be fruitfully attempted in case of education. In the following paragraphs, attempt is made to give a simple programming model of education, which combines the ideas of manpower planning, educational level considerations and cost considerations.

A Simple Planning Model for Education

The definition of the objective function in case of education is extremely difficult. There are innumerable considerations—some complementary and some conflicting—to be considered in the objective function. However, in view of the resource scarcities, we can consider cost minimization itself as the objective function for our programming model. The cost of providing education should be minimized subject to the conditions that the educational level in the country is not allowed to fall, on the contrary it should increase. A balance is to be struck between general and technical education, which is given by the broad manpower needs of the country. There is an overall expansion of educational facilities (education's contribution to economy's growth is effectively raised) and the quality considerations of education are not to be lost sight of. In mathematical terms, the model can be stated as below:
The variables are:

X_1 = Enrolment in the lower level education (primary, and secondary school) as a percentage of population of 6 to 19 year age group.
X_2 = Non-technical higher education enrolment as a percentage of population of age group 20 to 24 years.
X_3 = Technical education enrolment as a percentage of population of age group 6 to 24 years.
X_4 = Required addition of trained teachers to the total number of teachers.

The coefficients exogenously determined are:

β_1 = Per student expenditures (unit costs) in first level education.

β_2 = Unit costs in a higher education.

β_3 = Unit costs in technical education.

These unit costs are determined by the educationists taking into consideration different factors such as recent inventions in teaching techniques, space requirements, teachers' salaries, class size etc. They are assumed to be based on the existing level of instruction, *i.e.*, the existing supply of trained teachers. The addition of the trained teachers is therefore considered as an unknown variable in the model. It is also implicitly assumed that for effective education, only trained persons will be recognized as teachers hereafter.

n_1, n_2 are the number of people in the relevant age groups (6 to 19, and 20 to 24 : $n_3 = n_1 + n_2$). These are known from the census figures. W = Salary per trained teacher—determined exogenously on the basis of living standards and work effort.

Total cost of providing education in $T+1$ period can be expressed as:

$$Z = \Big[\beta_{1_{T+1}} n_{1_{T+1}} X_{1_{T+1}} + \beta_{2_{T+1}} n_{2_{T+1}} X_{2} + {}_{T+1}\beta_{3_{T+1}} n_{3_{T+1}} X_{3_{T+1}} + W_{T+1} X_{4_{T+1}} \Big]$$

The total cost is to be minimized subject to the following restrictions:

1. *Educational Level is to be Raised.* Once we admit the fact that raising the level of education rather than raising the earnings of the individuals is the prime objective of an education programme*, the fundamental question is how to define and quantify this tricky concept of educational level. An attempt has been made to present an index of educational level in the country with the help of the statistical technique of factor analysis.[15] Assuming that the first factor explains a major portion of the combined variance of the variables indicating different aspects of educational development (*i.e.* the four variables specified in the objective function), factor observations for the T^th^ period can be written as:

$$F_{1T} = K_{11}X_{1T} + K_{21}X_{2T} + K_{31}X_{3T} + K_{41}X_{4T}$$

Where *K's* are pattern coefficients obtained from the factor analysis[16]. F_1T now represents a ' comprehensive ' index of educational level.

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*The earnings increment can be one of the side effect of increased educational level. In consideration of earnings as an objective of educational plan, we have an instance of the confusion about the objective and the spillover.

[15] P. R. Panchamukhi, 'Measurement of Educational Output', Conference Number, *I.E.J.*, 1965.

[16] For details see the paper *op. cit.*, *I.E.J.* 1965 (Annual) and the references cited therein.

Assuming *K's* to hold good for the next time period $T+1$ also, we can write:

$$F_{1_{T+1}} = K_{11}X_{1_{T+1}} + K_{21}X_{2_{T+1}} + K_{31}X_{3_{T+1}} + K_{41}X_{4_{T+1}}$$

Where *K*'s are known and *X*'s are unknown. $F_{1_{T+1}}$ would now present an index of educational level for $T+1$.

The first restriction is that the educational level of $T+1$ period must be greater than that in T^{th} period, plus a certain desirable growth amount, C°. *i.e.*

$$K_{11}X_{1_{T+1}} + K_{21}X_{2_{T+1}} + K_{31}X_{3_{T+1}} + K_{41}X_{4_{T+1}} > F_1T + C^\circ$$

2. A balance between technical and general education is to be struck and at the same time the growing needs of technical manpower are to be met. This condition can be expressed as:

$$n_{3_{T+1}} X_{3_{T+1}} = b \left[n_{1_{T+1}} X_{1_{T+1}} + n_{2_{T+1}} X_{2_{T+1}} \right]$$

This means that technical education enrolment is equal to a certain percentage *b* of non-technical education enrolment. '*b*' is the norm to strike some desirable balance between the two types of education. It is exogenously determined. On account of the over emphasis of technical education in recent years, there is a likelihood of flooding the labour market with technical personnel. And consequently on account of the scarcity of personnel with general educational qualifications technically educated persons will have to be employed in their place. This obviously is waste of material as well as human resources. Though this state of affairs may not come about immediately but there is a fear of its coming. Already in India there is a glut of civil engineers and some highly trained technical personnel (*e.g.* Law graduates) have been taking up jobs of clerks and administrators. In the process of over-emphasis on technical education, some subjects (like sanskrit etc.) have been completely ignored. In order to avoid the likely extreme imbalance in the manpower situation and the educational system, educationists may suggest that the present relation between technical and non-technical enrolment may be maintained in the future also. Or after studying the situation in some developed and developing countries they might suggest a balancing coefficient that they feel is most desirable from the country's view point. This would indirectly take account of the broad requirements of manpower and also the healthy growth of the labour markets in the future, simultaneously giving importance to the development of a balance in the educational system itself. b is such a balancing coefficient for technical and non-technical education[17].

3. *Expansion of Educational Facilities.* This factor can be taken to be indirectly represented in the total enrolment figures. Thus,

$$ {n_1}_{T+1} {X_1}_{T+1} + {n_2}_{T+1} {X_2}_{T+1} + {n_3}_{T+1} {X_3}_{T+1} > \text{Total enrolment in period } T \text{ (known)} $$

4. *Quality of Instruction is Raised.* Educationists would agree that with a smaller size class per teacher, the individual attention to the students would be greater and teaching would be more effective. The student teacher ratio therefore must be reduced to indicate better instruction and effective learning. Thus this condition can be expressed in the following way:

$$ \frac{{n_1}_{T+1} {X_1}_{T+1} + {n_2}_{T+1} {X_2}_{T+1} + {n_3}_{T+1} {X_3}_{T+1}}{{X_4}_{T+1+N}} < \text{present student teacher ratio} $$

Where $N =$ Total number of teachers in Tth period, therefore a known figure.

In the form of a sum, the linear programming model can be put as below:

$$ \text{Minimize } Z = \Big[{\beta_1}_{T+1} {n_1}_{T+1} {X_1}_{T+1} + {P_2}_{T+1} {n_2}_{T+1} {X_2}_{T+1} + {P_3}_{T+1} \\ {n_3}_{T+1} {X_3}_{T+1} + W_{T+1}{}^{4}X \Big] $$

Subject to the linear restrictions that

$$ K_{11} {X_1}_{T+1} + K_{21} {X_2}_{T+1} + K_{31} {X_3}_{T+1} + K_{41} {X_4}_{T+1} > {F_1}_T + C^{\circ} $$

$$ {n_3}_{T+1} {X_3}_{T+1} = 6 \left[{n_1}_{T+1} {X_1}_{T+1} + {n_2}_{T+1} {X_2}_{T+\mathrm{T}} \right] $$

$$ {n_1}_{T+1} {X_1}_{T+1} + {n_2}_{T+1} {X_2}_{T+1} + {n_3}_{T+1} {X_3}_{T+1} > \text{Total enrolment in period } T \text{ (known)} $$

$$ \frac{{n_1}_{T+1} {X_1}_{T+1} + {n_2}_{T+1} {X_2}_{T+1} + {n_3}_{T+1} {X_3}_{T+1}}{{X_4}_{T+1} + N} < \text{Student teacher ratio in period } T \text{ (known)} $$

Properties of the Model

i. Instead of considering purely economic benefits of education (as earnings) as is generally done in the current literature, the model suggests that the primary objective of raising educational level of a country must receive a priority in the investment decisions in education.

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[17] General education (secondary) enrolment as a percent of total enrolment for example, varies between 25 to 96 in some developing countries and 50 to 87 in some developed countries. See Edn. and Technical and Vocational Training.

ii. Since broad manpower factors are also incorporated in the model, the investment criterion and the actual allocation decisions would be based on co-ordinated factors of educational and economic needs of the country.

iii. Some coefficients are assumed to remain constant over time. For example *K*'s the pattern coefficients are the main constants of the model. If the factor analysis is applied to a fairly long series of observations on the variables, then, perhaps the constancy of the K's in the near future need not be objected to. Further it may be noted that the index of the level of education can be made more comprehensive by introducing more variables indicating different aspects of educational development. Consequently these variables have to be appropriately introduced into the objective function. The suggested model only shows a possible approach towards planning.

iv. Good amount of data compilation and estimation process would be involved if the model is to be actually used in planning. The population figures according to different age groups, the estimates of unit costs, supply of teachers, etc. will have to be known before hand.

The solutions of this model would give the magnitudes of enrolments in different types and levels of education and the number of trained teachers as per the manpower and educational considerations, that would minimize the total costs of education. Cost minimization factor will have to be stressed in particular as there are many competing demands on the scarce resources of the country. This point has been already recognized by the Education Commission.

Concluding Observations

Education resembles other industries in many respects and the tools for analysing the other industries can be fruitfully employed for the analysis of the education industry. However, in view of some of the peculiarities of the education industry, a modification in the tools is necessary before they are actually employed. The fundamental modifications are in respect of the measurement of the output and inputs of this industry. In this process education's impact on employment will have to be considered. The present trend of definition of productivity of education in terms of earnings is a partial approach, and this approach, becomes still more partial if employment impacts of education are not taken into account. The planning in education industry will have to emphasize the primary purpose of education in addition to the above effects. Operations research techniques can be meaningfully employed in planning decisions in the education industry. We have not touched upon many other problems in connection with the education industry, such as depreciation problems (obsolescence of education), tax treatment, finance aspects, international flight of educational capital, construction of a suitable price index for education industry and so on. The present paper makes a modest attempt at showing the possibility of analysing the education industry in a similar way like other industries.

APPENDIX

TABLE 1

EMPLOYMENT IN (FORMAL) EDUCATION INDUSTRY IN INDIA

(in 000)

			Administrative Staff					
S. No.	*Year*	*No. of Teachers*	*Administrative and Lower level Staff in Primary Education*	*Administrative Staff in post-primary Education*	*Lower Staff in post-primary Education*	*Lower Staff in Higher Education*	*Administrative Staff in Higher Education*	*Total Employment*
0	1	2	3	4	5	6	7	8
1.	1950–51	803·5	38·4	17·2	8·6	1·6	1·6	870·9
2.	1951–52	853·3	39·6	19·2	9·6	1·8	1·8	925·3
3.	1952–53	896·0	40·6	20·4	10·2	2·0	2·0	971·2
4.	1953–54	955·3	43·4	21·6	10·8	2·3	2·3	1,035·7
5.	1954–55	1,032·0	46·4	22·8	11·4	2·6	2·6	1,117·8
6.	1955–56	1,106·5	50·4	24·8	12·4	2·8	2·8	1,199·7
7.	1956–57	1,169·7	53·4	26·4	13·2	3·1	3·1	1,268·9
8.	1957–58	1,231·4	56·4	28·4	14·2	3·3	3·3	1,337·0
9.	1958–59	1,308·1	61·4	30·8	15·4	3·7	3·7	1,423·1
10.	1959–60	1,406·0	65·6	34·4	17·2	4·0	4·0	1,531·2
11.	1960–61	1,508·1	70·0	38·4	19·2	4·1	4·1	1,643·9

Notes: Col. (3) One per every 500 students
Col. (4) Two per every 500 students
Col. (5) One per every 500 students
Col. (6) One per every 250 students
Col. (7) One per every 250 students

These assumptions are made on the observation of the employment trend in the Bombay University and other institutions. An additional figure of 5,000 should be added to Col. (8) to get the total employment figure, as about 5,000 persons are employed in the Ministry of Education, Government of India.

APPENDIX

TABLE 2

BOMBAY UNIVERSITY: DATA ON COLLEGES FOR 1963-64

I. Arts and Science Colleges 1	*No. of Students* 2	*Average recurring Expenditure* 3	*Average expenditure on teaching staff* 4
A	115	1191·4	540·6
B	186	1359·1	300·4
C	332	1110·0	361·0
D	505	465·3	253·4
E	574	750·1	272·8
F	648	369·7	153·9
G	804	556·6	358·1
H	566	656·1	286·3
I	1042	623·1	447·5
J	1100	623·0	200·7
K	1212	485·9	218·3
L	1224	812·5	277·1
M	1234	556·1	182·0
N	1529	381·1	198·2
O	1897	403·5	164·3
P	1902	402·9	246·3
Q	1974	453·7	222·2
R	1988	295·8	146·8
S	2452	356·0	177·6
T	2541	331·2	244·5
U	2627	440·3	222·4
V	2552	354·5	159·7
W	2738	429·5	265·6
X	2875	329·0	137·4
Y	2911	280·8	145·0
II. Commerce Colleges			
A	278	467·2	188·4
B	650	402·0	118·1
C	885	345·3	125·9
D	965	295·3	108·2
E	1010	318·4	120·3
F	1070	217·7	162·0
G	1220	271·6	165·0
III. Training Colleges			
A	19	1554·2	947·3
B	45	1129·0	675·8
C	161	664·0	328·9
D	231	817·0	501·8
IV. Law Colleges			
A	367	194·2	96·2
B	680	209·8	71·5
C	873	216·2	104·5
D	1101	196·2	113·8

Chapter Nineteen

Planning Models for Optimum Allocation of Resources in Education

M. S. RAMANUJAM*

Introductory

The need for explicit educational planning is increasingly gaining acceptance in recent years so much so that educational planning and economic planning are currently treated as being complementary to each other. Consequently the present emphasis in educational planning is on determining the optimum amount of education or skills[1] of each ' kind ' and ' level '[2] required for achieving specified economic objectives. Now this could be viewed in two different ways: First it can be viewed as one of determining the optimum level of resources allocated to each ' kind ' and ' level ' of education *vis-a-vis* other sectors of the economy. Alternatively if the educational budget is given exogenously the problem would then be that of distributing it optimally[3] among the various ' kinds ' and ' levels ' of education.

In the analysis we are attempting , educational planning is taken as a problem in working out the optimal distribution of an exogenously given educational budget.

In Section I three different, programming models are presented. Model I tries to maximize the net contribution of education to national income. Model II , which is an improvement, in certain respects, over model I attempts at maximizing the scale of human capital formation of a given composition at the terminal point. Model III, on the other hand, has minimization of educational budget as its objective.

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[1] We do not make any distinction between a kind or level of education on the one hand and a 'kind' or 'level' of skill on the other, as all skill formation is through formal education alone.

[2] 'Kind' denotes an area of discipline in education while 'level' indicates the stage reached in the discipline concerned.

[3] With the given educational budget it could so happen that the system turns out to be infeasible, as we are proposing constrained optimisation models. In such a case we have to augment the given educational budget to the extent that it renders the system feasible.

Section II which follows later gives in some detail the methods or procedures adopted in the providing of empirical content to the bare models.

SECTION I

The models that are presented here are exercises in constrained optimization. These are presented as straightforward linear programming formulations. These are dynamic in character. Instrument variables in these models are the enrolments to different 'kinds' and 'levels' of education. The models when operated sequentially on a period[4] to period basis, discretely, yield optimum values for each of the instrument variables again in each period of the time horizon of the models. In other words, what we have at the end of the exercise is a time profile of enrolments in each 'kind' and 'level' of education. Now, given the unit costs of education this automatically yields a time pattern of resource use in each 'kind' and 'level' of education.

Before we proceed further it would be necessary to set out the main assumptions. Only formal education is considered. Also, we are assuming compulsory primary education. Besides we are not considering after the post-graduate level in any kind of education. Yet another assumption is that manpower requirements of different types are taken to have been met by domestic human capital formation alone.

Notation

Endogenous variables:

X_{it} = enrolment in the education type i at time t.

X_{ijt} = enrolment in the school of type j originating from schools of type i at time t.

$$i, j = 1, 1, \ldots . m$$
$$t = 1, 2 \ldots . n.$$

where 'm' is the number of 'kinds' and 'levels' of education and 'n' the number of years in the plan period.

T_{irt} = new teachers of type r emanating out of education type i at time t.

W_{it} = new labour force with i-th type of education.

D_{it} = drop-outs from the school of type i at time t.

S_{it} = stock of skills of type i at time t.

$$i = 1, 2, \ldots . m$$
$$r = 1, 2, 3, 4; \quad t = 1, 2, \ldots . n.$$

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[4] Time unit of the periods will have to be so chosen as to suit our convenience.

Exogenous variable:

M_t = population of the middle school going age at time t.

B_t = educational budget at time t.

$S^*_{it_1}$ = manpower requirements of education type i at time t_1.

$i = 1, 2, \ldots . m;$

$t = 1, 2, \ldots . n.$

T_{ro} = stock of teachers of type r at the base year.

$r = 1, 2, 3, 4$

Constants:

y_i = discounted life time returns[5] of enrolment into i-th type education.

y'_i = discounted opportunity costs[6] of i-th type of education.

$\propto$ = rate of interest.

d_i = death rate[7] of people with i-th type education.

w_i = wastage[8] of enrolments into i-th type of education.

$i = 1, 2, \ldots . m.$

C_i = unit costs of i-th type of education.

k_i = duration of i-th type of education.

u_{ri} = teacher-student ratio for teachers of r-th type in i-th education type.

Definition:

$D_{it} = w_i \, X_i(t\text{-}k_i)$

This means that drop-outs[9] at any time t from i-th type of education are equal to the product of the wastage ratio and enrolment at time $(t - k_i)$ of i-th type of education.

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[5] Discounted life time returns of enrolment into i-th type of education are the cumulative discounted sum of earnings upto the age of retirement, adjusted for wastage and mortality. Discounting is done to the year of commencement of the income stream due to i-th type of education.

[6] Opportunity costs of i-th type of education are the cumulative discounted sum of income foregone from all income earning possibilities upto the completion of i-th type of education, starting from a type of education prior to i-th type, from which enrolment into i-th type originates. Here discounting is done separately for each income earning possibility. In each case, however, incomes are discounted to the year of commencement of the income stream.

[7] Death rate is adjusted for retirement also, as all persons die out of the system of after retirement.

[8] By wastage we mean the ratio of drop-outs to enrolments in any type of education.

[9] Drop-outs from any type of education are assumed to occur only at the end of the duration of the education type considered.

$$b_{ij} = \begin{cases} 0, \text{ if an education type '} i \text{' cannot pursue } j\text{-th type of education.} \\ 1, \text{ otherwise.} \end{cases}$$

$$e_{ij} = \begin{cases} 0, \text{ if a drop-out from } i\text{-th education type cannot enter labour force of } j\text{-th education type.} \\ 1, \text{ otherwise.} \end{cases}$$

$$f_{ir} = \begin{cases} 0, \text{ if an education type cannot become a teacher of } r\text{-th type.} \\ 1, \text{ otherwise.} \end{cases}$$

$$i, j = 1, 2, \ldots . m;$$
$$r = 1, 2, 3, 4.$$

y_{it} = discounted life time returns for an enrolment into i-th type of education at time t.

= $(1+\infty)^{-t}\, y_i$

y'_{it} = discounted opportunity costs for i-th type of education pursued at time t.

= $(1+x)^{-t}\, y'_i$

a_{it} = net discounted life time returns for enrolment into i-th type of education at time t.

= $y_{it} - y'_{it}$

c_{It} = present value of the unit cost of education at time t of type i

= $c_I\,(1+X)\text{-}t$

$$i = 1, 2, \ldots . m;$$
$$t = 1, 2, \ldots . n.$$

MODELS

Model I

Objective function :

$$\text{Max Y} = \sum_{i=1}^{m} \sum_{t=Q}^{n} a_{it} \; X_{it} \; 1 \qquad \ldots 1{\cdot}0$$

= net contribution to the present value of the future national income of an educational policy.

Constraints:

$$B_t = \sum_{j=1}^{m} C_{jt} \; X_{jt} \qquad \ldots 1{\cdot}1$$

$$(1\text{-}w_I)\, X_{i\,(t\text{-}k_I)} - \sum_{i,j\; j=1}^{m} b_{ij}\, X_{ijt} - W_{it} - \sum_{r\; r=1}^{4} f_{ir}\, T_{irt} = 0 \qquad \ldots 1{\cdot}2$$

$$S_{it} = S_{io}\,(i\text{-}d_i)^t + \sum_{t'=0}^{t-1} (1-d_i)^{t-1-t^1}\,(W_{jt} + \sum_{j=1}^{m} e_{ij}\,D_{jt} \quad \ldots\ 1{\cdot}3$$

$$t = 1, 2, \ldots .\ n.$$

$$S_{it} \geqslant S^*_{it} \quad \ldots\ 1{\cdot}4$$

$$i, j = 1, 2, \ldots .\ m;$$

$$t = 1, 2, \ldots .\ n.$$

$$\Sigma_i u_{ri}\,X_{it} \leqslant T_{ro}\,(1-d_r)^t + \sum_{t'=0}^{t-1} \sum_{t-1}^{m} (1-d_r)^{t-1-t^1} f_{ir}\,T_{irt} \quad \ldots\ 1{\cdot}5$$

$$X_{it} \leqslant M_t \quad \ldots\ 1{\cdot}6$$

$$X_{it} \geqslant X_{it-i} \quad \ldots\ 1{\cdot}7$$

$$i = 1, 2, \ldots .\ m;$$

$$t = 1, 2, \ldots .\ n;$$

$$X_{ijtj}\ X_{itj}\ W_{itj}\ T_{irt} \geqslant 0. \quad \ldots\ 1{\cdot}8$$

$$i, j = 1, 2, \ldots .\ m;$$

$$t = 1, 2, \ldots .\ n;$$

$$r = 1, 2, 3, 4.$$

Constraint (1·1) says that the cost of any educational policy at time '*t*' be exactly equal to the total budget allocated to the education sector at time *t*. As already mentioned the educational budget is given exogenously as a percentage of the national income at time *t*.

Equation (1·2) states that the outflow of *i*-th type of education be equal to the sum of those who enter *j*-th type of education after completing *i*-th type of education, those who enter the labour force with *i*-th type of education alone and those who become teachers of the *r*-th type. This means that there will be conservation of flow within the system.

Equation (1·3) states that the stock of people with *i*-th type of education at time *t* is equal to the survivors of initial stock plus survivors of subsequent additions (to the labour force with the *i*-th type of education and drop-out from *j*-th type of education joining the labour force with *i*-th type of education) from 1 to *t*-1.

Inequality (1·4) states that the stock of skills of type *i* at each time point *t* be at least as much as are required by the plan preceding that point.

Inequality (1·5) states that the requirements of *r*-th type of teachers cannot exceed the stock available. The capacity of the educational system is given only in terms of teachers; buildings and other input requirements of the educational system are not binding. They are, however, indirectly taken care of in the budget constraint.

Constraint (1·6) states that enrolments into middle school at any time t be restricted to the availability of population of the middle school going age.

Inequality (1·7) states that enrolment to each type of education i be non-decreasing over time. The rationale behind such a constraint is that it takes care of the terminal conditions and avoids such complications as human capital decumulation in the post-terminal period. Further, it provides a continuous stream of students at each point of time t in each type of education i in the system, indicating the socio-cultural development of the economy considered. Constraint (1·8) is the usual non-negativity constraint.

The model outlined above is a blend of the manpower requirements[10] approach and the cost-benefit approach to educational planning. The demand for the outputs of the educational sector comprise of the demand generated individually by the educational and non-educational sectors of the economy. They are estimated, just the way it is done in the manpower requirements approach, using fixed skill-output ratios. In evolving an optimal allocation of the educational budget among the various 'kinds' and 'levels' of education, marginal social benefits accruing from each type of education are compared with the marginal social costs pertaining to each type of education, thus incorporating the essential elements of the cost-benefit approach.

The cost-benefit approach attempts to calculate marginal benefits is the same manner as the Denison's approach. Actually average income figures are taken to be representative of the marginal incomes, which implies the assumption of a perfectly competitive labour market condition. Further, income that accrues to a particular type of education need not necessarily be entirely due to that type of education alone. It could as well depend upon the socio-economic background, ability, intelligence and such like factors. As the above model is essentially a variant of the cost-benefit approach, it suffers to that extent from some of the defects of the approach.

In addition to the limitations already mentioned there is another point that has to be brought about, which relates to the arbitrariness that creeps into the system contingent on the choice of the rate of interest, used in discounting future returns. It is a point generally conceded that the present value of life time returns is sensitive to the rate of interest used.[11]

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[10] Ref. W. G. Bowen, 'Assessing the Economic Contribution of Education': An Appraisal of Alternative Approaches, in *Economic Aspects of Education* OECD and T. W. Schultz, *Economic Value of Education.*

[11] Ref. H. S. Houthakker, 'Education and Income' *Review of Economics and Statistics*, February, 1959.

In calculating life time returns, we will be using the age-education-income profile of a particular year assuming that this pattern would remain constant over the entire reference period. This, no doubt, is a very restrictive assumption, as it clearly implies that for each education category the ratio between incomes at any two ages represents a stable historical life cycle, that is repeated with each successive age cohort.[12]

Now, one way of escaping some of these restrictive assumptions and the contingent arbitrariness is to replace the preference function (1·0) by an alternative preference function with a weaker set of assumptions.

Bearing in mind that we have so far carried out a value maximization type of approach and that most of the restrictions and arbitrariness are necessitated by the empirical procedure to be followed in estimating the valuation factors, we could think of quantity maximization as an alternative.

At this stage let us make the assumption that there are no substitution possibilities among the various ' kinds ' and ' levels ' of education so that we will be in a position to define a composite skill which comprises of different ' kinds ' and ' levels ' of education used in fixed proportions. Certainly, this is a very drastic assumption, but not worse than having to add up all types of skills from engineers, physicians and economist to barbers, fishermen and cobblers in arriving at the stock of human capital. Further, in general wage induced substitutions among several ' kinds ' and ' levels ' of education—at least in the short run—are likely to be insignificant because of the longer lags involved in the production of skills. It is more so in the case of a country like India where mobility is very much conditioned due to several social and bureaucratic practices. Also, in using a composite skill we will be, clearly avoiding the problem of separately weighing each ' kind ' and ' level ' of education in assessing the extent of human capital formation, thus achieving the purpose of the alternative model to be developed.

The model which follows attempts to maximize the stock of human capital at the terminal point; in the sense that when the proportions in which the skills are to emerge at the end of the reference period are given the scale of accumulation of the composite skill at that time is to be as large as possible.

It should be noted that economic planning models with the above type of objectives are, however, not unfamiliar to us. The preference function here is the one customarily employed in discussions on the ' turnpike theorem.[13] Kantarovich adopts a similar objective function in developing a long-term finite horizon production plan.[14] Chakravarty and Lefeber[15] also use the notion of a composite consumption good in trying to maximize the discounted sum of various commodities over a period.

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[12] Ref. Mary Jean Bowman, 'Human Capital: Concepts and Measures' *Economics of Higher Education*, (ed.) Selma J. Mushkin.

[13] Ref J. R. Hicks, 'Prices and the Turnpike, 1. The Story of a Mares Nest', *Review of Economic Studies*, Vol. 28, 1960-61.

With the above-mentioned objective in view we would now go on to a different formulation of Model I.

Model II

Objective Function:

$$Max\ S_T \text{ subject to} \qquad \ldots\ 2.0$$

Constraints:

$$g_i\, S_T \leqslant S_{iT} \qquad \ldots\ 2.1$$

$g = (g_i)$ is a unit sum vector of m dimensions and $_T$ is the terminal point

$$i = 1, 2, \ldots\ldots m.$$

$$B_t = \sum_{j=1}^{m} C_{jt}\, X_{jt} \qquad \ldots\ 2.2$$

$$(1\text{-}w_i)\, X_i\,(t\text{-}k_i) - \sum_{j=1}^{m} b_{ij}\, X_{ijt} - W_{it} \qquad \ldots\ 2.3$$

$$- \sum_{r=1}^{4} f_{ir}\, T_{irt} = 0$$

$$S_{it} = S_{io}\,(1\text{-}d_i)^t + \sum_{t^1=0}^{t-1} (1\text{-}d_i)^{t-1-t_1}\,(W_{it} + \sum_{j=1}^{m} e_{ij}\, D_{jt}) \qquad \ldots\ 2.4$$

$$S_{it1} \geqslant S_i{}^{*}t \qquad \ldots\ 2.5$$

$$t_1 = 5, 10, 15, 20, \ldots\ldots n.$$

$$\Sigma_i\ u_{ri}\, X_{it} \leqslant T_{ro}\,(1\text{-}d_i)^t \qquad \ldots\ 2.6$$

$$+ \sum_{t=0}^{t-1} \sum_{i=1}^{m} (1\text{-}d_r)^{t-1-t'}\, f_{ir}\, T_{irt}$$

$$X_{it} \leqslant M_t \qquad \ldots\ 2.7$$

$$X_{it} \geqslant X_{it-1} \qquad \ldots\ 2.8$$

$$X_{ijt},\ X_{jt},\ W_{it},\ T_{irt} \geqslant 0 \qquad \ldots\ 2.9$$

$$i, j = 1, 2, \ldots m$$

$$r = 1, 2, 3, 4.$$

$$t = 1, 2, \ldots m.$$

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[14] L. V. Kantarovich, *The Best Use of Economic Resources*, Appendix 1, p. 284.

[15] S. Chakravarty and L. Lefeber, 'An Optimizing Model', *The Economic Weekly*, February 1965.

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Maximand (2.0) is the scale of human capital accumulation, as at the terminal point of a given composition $g = (Ii)$ of various types of education. We, therefore, have to maximize the scale of accumulation subject to constraints (2.1) to (2.9).

Constraint (2.1) states that at the terminal point the scale of accumulation should be restricted to what the system is capable of providing. The other constraints (2.2) to (2.9) correspond to constraints (1.1) to (1.8) of Model I.

It is discouraging to observe that even Model II needs an arbitrary assumption regarding the terminal composition of the various 'kinds' and 'levels' of education. This arbitrariness may perhaps be avoided through simulation techniques or parametric variations.

Next we consider an alternative set of conditions to our system by taking out (2.0) and (2.1) of model II and elevating (2.2) to the status of a preference function. The objective here is to minimize the budget of the educational sector. Thus we have model III which follows now.

Model III

Objective function :

$$Min\ B = \sum B_t = \sum_{t,\,j} C_{jt}\, X_{jt} \text{ subject to} \qquad \ldots 3.0$$

$$j = 1, 2, \ldots r\, m$$
$$t = 1, 2, \ldots .\, n.$$

Constraints :

$$(1\text{-}w_i)\, X_{i\,(t\text{-}k_i)} - \sum_{j=1}^{m} b_{ij}\, X_{ijt} - W_{it} \qquad \ldots 3.1$$
$$- \sum_{r=1}^{4} f_{ir}\, T_{irt} = 0$$

$$S_{it} = S_{io}\,(1\text{-}d_i)^t + \sum_{t'=0}^{t\text{-}1} (1\text{-}d_i)^{t-1-t'} \left(W_{it} + \sum_{j=1}^{m} e_{ij}\, D_{jt}\right) \qquad \ldots 3.2$$

$$S_{it} \geqslant S^*_{it}$$
$$t = 1, 2, \ldots .\, n. \qquad \ldots 3.3$$

$$\sum u_{ri}\, X_{it} \leqslant T_{ro}\,(1\text{-}d_i)^t + \sum_{t_t=0}^{t\text{-}1} \sum_{i-1}^{m} (1\text{-}d_r)^{t-1-t'} f_{ir}\, T_{irt} \qquad \ldots 3.4$$

$$X_{it} \leqslant M_t$$
$$X_{it} \geqslant X_{it-1} \qquad \ldots 3.5$$
$$X_{ijt},\ X_{it},\ W_{it},\ T_{irt} \geqslant 0 \qquad \ldots 3.6$$
$$\ldots 3.7$$

$$i, j = 1, 2, \ldots . m$$
$$r = 1, 2, 3, 4.$$
$$t = 1, 2, \ldots . n.$$

Minimand (3.0) is a weighted function of the enrolments where the weights taken are the constant unit costs of education. The constraints of the Model III *i.e.*, (3.1) to (3.7) are the same as (1.2) to (1.8) of Model I, respectively.

This model serves a double purpose. Apart from attaining the status of an alternative model, it also provides a means of re-evaluating models I and II with a different set of B_t's which are derived here through a process of optimization. It should be remembered that B_t's in models I and II are based on an arbitrary assumption about the percentage of educational expenditure in the national income.

Model I, as has already been mentioned, has the maximization of contribution of education to national income as its objective. In formulating its objective function we had to calculate the net life time returns to each kind and level of education. These calculations necessitated several restrictive assumtions regarding initial income, income flows during the life time, discount rate and representativeness of the coefficient a_{it} ($i = 1, 2, \ldots . m$; $t = 1, 2, \ldots . n$) as the net contribution of an individual receiving i the type of education at time t. To avoid such restrictive assumptions we had to think of an alternative which is model II. In model II we are maximizing the scale of accumulation of the human capital, with a given composition, at the terminal point.

Model II, however, is not very encouraging as we need to make an arbitrary assumption on the terminal composition of the various types of education. Probably by simulating several terminal states, with regard to the composition of human capital, we might arrive at an optimal terminal composition.

As an alternative to model II we consider model III which involves minimization of costs to the economy of following an educational policy. Yet all these three models have a common set of limitations. It is desirable, therefore, to make them explicit before proceeding to the empirical part of the analysis.

Limitations

1. The models are all linear models with linear objective functions and linear constraints.

2. In model I, we consider strictly direct economic contribution of education to the present value of future national income, keeping out indirect economic contribution and non-economic benefits. This understates the value of the social welfare function.

3. Further, the models consider only formal education (that which is imparted through classroom lectures), ignoring such informal training facilities as in-service training and on-the-job training.

4. Besides, manpower requirements of the economy are entirely met by domestic human capital formation alone.

The effect of the first limitation in model I is that price elasticity of demand is infinite. This contradicts the basic requirement of manpower requirements approach, in that price elasticity is zero. Also, in all the three models the first limitation restricts cross derivatives (with respect to labour inputs), of the production function of the economy, to zero.

The effect of the last two limitations is that it overstates the optimum level of educational investment in all the three models.

We will now present the distinctive features of our system which, we should think, is as important or at least as desirable as that of listing the set of limitations binding our system. To the best of our knowledge there is only one model that is somewhat similar to our model I, which has been tried out by Samuel Bowles[16] for the Nigerian economy. His model seeks to maximize a weighted function of enrolments in various educational institutions over time subject to four sets of constraints The objective function measures the net contribution of each activity to the present value of future national income. In his system the constraints are as follows:

a. Constraints on ' the use of inputs which are produced within the educational system and which are defined as stock, namely, teachers '.

b. Constraints on ' the use of inputs which are generated within the system and are defined as flows, namely, students '.

c. Constraints on ' the use of inputs which are exogenously given to the system '.

d. ' Boundary Conditions.'

As may be seen the objective function in his model is quite similar to that of ours excepting for, that the weights attached to each type of enrolment in his system are net of unit costs of education also. It should be recalled that in our model, unit costs of education, appear in a separate set of constraints, namely, the budget constraints (1.1). His constraints (*a*) also are similar to our constraints (1.5). While he includes imported teachers also in the constraints (*a*), we rule out the possibilities of importing any ' kind ' or ' level ' of education, totally, from our system. Constraints (*b*) in his model serve a similar purpose, though partially, to that of our constraints (1.2) on the conservation of flow within the system. As against his constrains (*c*) we have the budget constraints (1.1) with one difference. In that he considers the exogenously supplied inputs in physical terms while we consider them in value terms. The boundary conditions (*c*) in his model and the monotonicity constraints (1.7) in our model are the terminal conditions of the respective models.

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[16] Samuel Bowles, '*The Efficient Allocation of Resources in Education*', *Quarterly Journal of Economics*, May 1967, Vol. LXXXI, No. 2, Also there is the model of Irma Adelman titled, '*A Linear Programming Model of Educational Planning—A case of Argentina*' (available in mimeographed form), her work is addressed to a much wider problem than that of ours.

At the first instance, his model appears to be quite sensible for judging problems of production of various types of education; but viewed as a problem in ' the efficient allocation of resources in education ' it is not a complete system. The sets of constraints he has chosen are not sufficient and so his system ceases to be consistent, as he claims it to be.[17] It is not enough if we maximize the production of various types of education valued at pre-determined valuation factors. What is more important is, we have to see that, the growing productions are also economically useful. The complete absence or ignorance of the needs of economy with regard to various types of education renders his system incomplete. As a consequence of this the following defects can also be attributed to his system.

1. In his constraints (*a*) apart from considering the stocks of various types of teachers, he should have considered stocks of other types of education also. Obviously he has not done this.
2. Whenever we set constraints on the terms which are defined as flow terms we have also to show that there is conservation of flow within the system. Clearly, his constraints (*b*) ignore this purpose.

The boundary conditions of his model are of a peculiar nature. If X_j^P is the number of students admitted to level *j* in period *P* ($j = 1, 2. \ldots, m$; $P = 1, 2, \ldots, n$) the boundary condition for admission levels in his model are

$$X_j^P \geqslant X_j^{P-1} \quad \text{(D1)}$$
$$X_j^P \leqslant X_j^{P-1} \quad \text{(D2)}$$

He attributes the reasons for the choice of 0.7 and 1.3, entering the above constraints as that of political and administrative nature.[18] It may be seen that administrative considerations are sufficiently cared for in constraints (*c*), as admissions to any type of education cannot exceed what the exogenously given inputs made available by the administration, allows for. Hence we can modify (D2) and rewrite it as

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[17] *Ibid.* Samuel Bowles, p. 203.

[18] *Ibid.* Samuel Bowles, p. 192.

$$X_j^P \geqslant X_j^{P-1} \qquad \text{(D2*)}$$
$$j = 1, 2, \ldots, m;\ P = 1, 2, \ldots, n)$$

Depending on the administrative feasibilities X_j^P would however lie within the closed interval.

$$a\, X_j^{P-1} \geqslant X_j^P \geqslant X_j^{P-1} \qquad \text{(D3)}$$

where a $\geqslant$ 1 is determined by the administrative feasibilities

$$(j = 1, 2, \ldots, m)$$
$$(P = 1, 2, \ldots, n)$$

As the upper bound is taken care of by the constraints (c), it does not need a specific mention and hence (D2*) would serve the same purpose as that of (D3).

If political considerations demand that enrolments in any type of education j ($j = 1, 2, \ldots, m$) at period P ($P = 1, 2, \ldots, n$) should be such that

$$X_j^P \geqslant 0.7\, X_j^{P-1}$$

it can easily be accomplished by (D2*) itself. Hence in the presence of (D2*), (D1) is not binding. Clearly, (D2*) is same as that of our terminal conditions (1.7).

The salient features of our approach as distinct from those of Samuel Bowles are as follows:

1. As against only one model of Samuel Bowles we have a set of three models presented in a sequence, with a purpose. In that, Model II is an improvement over Model I. Further, Model III apart from being an alternative to Model II, it also provides us a means to re-evaluate both of the models preceding it.
2. In some way, though subject to criticism, we take sufficient care of the needs of the economy through (1.4). As a consequence of this we have constraints (1.3) on the stocks of all types of education, and we have conservation of flow within the system as given by constraints (1.2). Also, constraints (1.3) take sufficient care of the dropouts through employing them in some occupation or other this obviously has not been done in Samuel Bowles' model.
3. Our terminal conditions (1.7) are more justified[19] than those of his boundary conditions.

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[19] For a discussion on the justification of the use of such terminal conditions refer Andrea Maneschi, 'Optimum Savings with Finite Planning Horizons: A Note', *International Economic Review*, Vol. 7, January 1966.

SECTION II

It has been stated earlier that the models are dynamic[20] in character. Also, we have viewed them as 'as if static' models,[21] in presenting them as straight forward linear programming formulations with each variable at a different time point as a new variable. Observing that production of skills has also a recursive character, we could have formulated them differently and analysed through dynamic programming recursion. In this alternative formulation there will be as many numbers of state parameters as the number of constraints in the original linear programming formulation.[22] This formulation is just another way of solving the problem and as such does not give rise to any additional advantages. On the other hand the position would be much worse as the number of state parameters would be much larger than what the present state of computational facilities can allow, to use the dynamic programming recursion.

Now we go to describe briefly the sequence to be adopted in the computational part of the analysis. First of all we have to determine the structure and then solve it for the optimal values of the instrument variables. To determine the structure we have to estimate the following:

- *a.* Future manpower requirements with each 'kind' and 'level' of education.
- *b.* Discounted life time returns and opportunity costs of each 'kind' and 'level' of education.
- *c.* Teacher-student ratios and wastage ratios of each 'kind' and 'level' of education.
- *d.* Unit costs of education of each 'kind' and 'level' and the levels of educational budgets.

a. Estimation of future manpower requirements involves classifying the labour force on an occupational basis and then projecting the future requirements in each occupational class and converting these occupational requirements into educational requirements.

The office of the Director General of Employment and Training (Government of India) has been collecting occupational information for all 331 occupations in each of the 343 types of industries. Occupations and industries, however, are classified according to the standard classification accepted by the Government of India. The information is collected for the 'private' and 'public' sectors separately. In the 'private' sector all establishments employing 25 or more with or without power are covered under the 'Employment Exchanges Act' of 1959. This is supplemented by similar information collected from smaller establishments in the 'private' sector employing 10 to 24 persons with or without power in selected employment areas on a voluntary basis. In respect of the 'public' sector however all establishments are covered.

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[20] We have used the word 'dynamic', here, as synonymous to intertemporal.

[21] E. Malinvaud, in his article on 'The Analogy between a temporal and intertemporal, Theories of Resources Allocation', *Review of Economic Studies*, Vol. 28, 1960-61, shows that static and dynamic theories are formally equivalent and that the difference is mainly due to the dimensionality. Barr and Manne also, have followed a similar approach. Ref. James L. Barr and Alan S., Manne, 'Numerical Experiments with Finite Horizon Planning Models', The *Indian Economic Review*, April 1967 (New Series).

[22] Ref. G. Hadley, *Non-linear and Dynamic Programming*, 1964, Sections 11.2 and 11.5.

The next step is, we use this industry wise information on occupations to arrive at a consolidated sector-wise classification, which is corresponding to the Planning Commission's 77-sector input-output Table.[23] With the help of the sector-wise output figures from the above table, which are given for 1964–65, we estimate skill-output ratios.[24]

Treating 1964–65 as the base year the skill output ratios for that year in each of the sectors are assumed to remain constant over the entire reference period. With the help of these sector-wise skill-output ratios and sector-wise economic projections manpower projections are made as at each of the time points 1970–71, 1975–76 and 1980–81. For the years 1970–71 and 1975–76 economic projection are taken as given in the 77-sector input-output Table of the Planning Commission. The trend between 1970–71 to 1975–76 has been further extrapolated to arrive at the sector-wise economic projections for 1980–81.

For converting the occupationally classified labour force into educationally classified labour force, information collected from the order cards of the Delhi employment exchanges is used.[25] A word about the order cards. Information in the order cards is supplied by the employers. Occupations are classified according to the standard occupational classification. For each job or occupation, information concerning educational qualifications required, salary offered and requirements regarding age, experience etc. are given. This particular occupation-education correspondence has been used to convert occupational projections into projections of educational requirements.

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[23] Ref. *Draft Fourth Plan, Material and Financial Balances* 1964-65, 1970-71 *and* 1975-76, PPD, Planning Commission, Government of India, September, 1966.

[24] Manpower data also fairly approximates to 1964-65. 'Private' sector occupational data is as in the week ending September 1963 and that of 'public' sector is as in the week ending September, 1964.

[25] The implicit assumption here is that, what is valid for the Delhi employment market is valid for the employment market of India as a whole.

b. Lifetime returns are estimated by making use of the age-education-income figures as given in the placed-index cards[26] of Delhi employment exchanges and age-education-income profile, available for several ' kinds ' and ' levels ' of education, as published by the Council of Scientific and Industrial Research (India).[27] Opportunity costs are estimated in a similar way making use of age-income-education information collected from the placed cards of Delhi employment exchanges.

In the literature on economics of education the discount rates hitherto normally used for discounting lifetime returns are 0, 3, 6, 8 per cent.[28] Apart from using these rates of discounts, for discounting lifetime returns and opportunity costs, it is also proposed to determine the range of the rate of discount for which the model is sensitive.

c. Both average and marginal teacher-student ratios and wastage ratios are estimated. For this purpose information published in the following is being used:

1. *University Development in India*, an annual publication of the University Grants Commission of India;
2. Education in India (annual), published by the Govt. of India; and
3. Craftsmen training scheme ' Employment Pattern of ex-trainees ' of the Directorate of Technical Education and Employment, Delhi.

d. Unit costs of each ' kind ' and ' level ' of education and the levels of educational budget for each year upto 1980–81 have been estimated in connection with the recent Education Commission of India.[29] These estimates are being used in our analysis.

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[26] In the index cards information is supplied by the candidates seeking employment. The information is with regard to date of birth, educational qualifications, experience and income sought. Once a candidate gets employed his index card becomes a placed-index card. Income that a candidate gets on employment is also notified in the placed index card.

[27] C.S.I.R. publishes a bulletin once in two months on technical manpower. Each bulletin, entitled '*Technical Manpower*' deals with one type of education.

[28] *Ibid.*, H. S. Houthakker.

[29] *Vide* Tables 19.9 and 19.30 of the *Education Commission Report, 1964-66*, Ministry of Education, Government of India.

Chapter Twenty

Some Notes on Resource Allocation in Education

RANJIT K. SAU

Introduction

Some time back the chairman of a Seminar on Higher Education observed: 'From the beginning it seemed best not to have too many economists in this seminar, ... It is helpful to have non-economists around in meetings of this kind to restrain the economists who might forget that though the limitation of resources is very important, educational values are the major issue'.[1] In my view, the major role of non-economists in a seminar on education is not just to restrain the economists or *vice versa*; rather both the groups should help each other to keep in mind that there are multiple aspects of education: social, political, cultural, as well as, economic. Indeed, education is not fully an economic commodity; it is much more than that: it is a necessity of modern civilization.

Nevertheless, so long as any activity—and education is no exception at that—draws upon the scarce resources of the society, it is, I think, perfectly legitimate to ask ourselves: Are we putting into it the resources of right quantity and quality? Are we making 'the best use' of the resources which are going into it anyway? And so on. These questions are difficult to answer. But these are important questions. In India, after all, as much as 3% of the national income is being currently spent on education. Incidentally, the corresponding ratio is much higher—much more than 6%—in Japan, the U.S.A. and the U.S.S.R.[2]

One of the characteristic features of education is its dualism: it is simultaneously a consumption and an investment.[3] The need for education as a consumption item is, by and large, a function of social, political and cultural factors, while its demand as an investment is determined mainly by its economic productivity. Furthermore, education is a time-consuming process; hence, to the extent it is an investment, it has a long gestation lag. All this underlines the importance of careful co-ordination between over-all economic planning in one hand, and long-term educational planning on the other.

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[1] Seymour E. Harris, 'Prefatory Notes', *Review of Economics and Statistics* (Supplement), XLII, August 1960, p. 3.

[2] *Education and National Development—Report of the Education Commission*, 1964-66, New Delhi, 1966, p. 466. Hereafter this report will be referred to as the *E.C. Report*.

[3] Some activities primarily affect future well-being, while others have their main impact in the present. Dining is an example of the latter, while purchase of a car exemplifies the former. Both earnings and consumption can be effected: on-the-job training primarily affects earnings, a new sail boat primarily affects consumption, and......education is said to affect both. The effects may operate either through physical resources, such as a sail boat, or through human resources, such as a college education. Gary S. Becker, 'Investment in Human Capital: A Theoretical Analysis' *Journal of Political Economy* (Supplement), LXX, October 1962, p. 9.

It seems to me that economic analysis can enable us to do a two-fold job: (*a*) achieving ' balance ' between the education sector and the rest of the economy, and (*b*) making the ' best use ' of the available resources engaged in education—both these *within the given framework of social and cultural values*.

A basic step towards formulating any policy is to be clear about what precisely the *data* of the system are that have to be considered as given to us and may not be changed. Similarly, we must know the *targets* to be achieved, and the *instruments* for achieving them.[4] In a word, we have to be duly aware of the parameters, fully conscious of the objectives, and always alert about our scope of exercising choice. Particularly to delineate and highlight the spheres of economic choice in educational planning we have developed an input-output model which appears in the Appendix at the end of this chapter.

In what follows, first we briefly outline the various approaches to educational planning and review them in the light of Indian conditions. Next we deal with some aspects of costs of education in India. Then we show, with two examples, how the techniques of economic optimization can be used in the context of educational planning, keeping within the limits of social and cultural perimeter.

Approaches to Educational Planning

There are broadly *three* methods of projecting the scale and pattern of education in future which may be classified under the following heads—(1) the ' demand-for-places ', (2) the ' manpower-needs ', and (3) the ' rate-of-return on human capital '.

The Demand-for-Places. This approach underlies the Robbins Committee Report on higher education in Britain.[5] According to the method followed by the Robbins Committee there are five major (and several minor) steps in the projection of demand for places in education:

i. to estimate the size of age groups relevant to higher education ;

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[4] *See* Jan Tinbergen, *On The Theory of Economic Policy*, Amsterdam, 1955, Chap. II.

[5] *See* C. A. Moser and P.R.G. Layard, 'Planning the Scale of Higher Education in Britain: Some Statistical Problems', *Journal of the Royal Statistical Society*, December 1964, 473-526.

ii. to estimate what proportions of these age groups are likely to reach the particular levels of school-leaving attainment now considered relevant for entry to higher education;
iii. to estimate what proportions of those so qualified will apply to enter higher education;
iv. to decide what proportions of these applicants should be given places; and
v. to decide what length of study to assume.

Steps (i) to (iv) relate to entrants, while (v) converts entrants into ' places '.[6] With regard to the crucial policy decision on (iv), the Committee was firmly of the opinion that in future ' there should be no change in the proportion of applicants with each level of qualification who are admitted '; the current proportion should hold in future as well.[7]

It is also interesting to note that while the Robbins Committee applied the demand-for-places method for estimating the total entry to higher education, the manpower-needs approach was used in arriving at the sectoral split among various levels of higher education.[8]

Although the demand-for-places method of educational planning is apparently based upon the currently revealed preference of the people as it were, it is not necessarily so in effect. Because it does not take into account who is paying for the costs of education and how much. As a matter of fact, an educational plan for India in terms of the demand-for-places approach may be well beyond the limits of available resources.

The Manpower-Needs. Industry, agriculture, mining, construction, trade, commerce, and medical, legal and other services all require educated manpower. The demand for education may be a difficult thing to quantify; but the demand for educated manpower is relatively easy to estimate. For inter-sectoral balance in the economy, the ' output ' of the education sector has to be consistent with the requirements of the other sectors; and on this premise an education plan may be worked out. The literature on this topic is voluminous.[9]

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[6] *Ibid*, 477.

[7] *Ibid*, 485.

[8] *Ibid*, 487.

[9] *See*, for example, O.E.C.D. Policy Conference on Economic Growth and Investment in Education (Washington, October 1961): vol. II—*Targets for Education in Europe in 1970*, and vol. IV—*The Planning of Education in relation to Economic Growth*; J. Tinbergen and H. C. Bos, 'A Planning Model for the Educational Requirements of Economic Development' in O.E.C.D., *The Residual Factor and Economic Growth*, Paris, 1964, 147-69; Gottfried Bombach, 'Long Term Requirements of Qualified Manpower in Relation to Economic Growth', in O.E.C.D., *Economic Aspects of Higher Education*, Paris, 1964, 201-21; R. S. Eckaus, 'Economic Criteria for Education and Planning', *Review of Economics and Statistics*, 1964, 181-90; and also the *E.C. Report*, 92-97.

We need not, however, confine ourselves only to the economic requirements of education as emphasised in the above approach. We may as well take into account the social and cultural aspects of education. 'Assuming that the relevance of each approach is granted', observes Parnes, 'it does not seem to make much difference which is used as a point of departure'.[10] If one establishes target enrolments in the various branches of the educational system *via* the 'cultural approach', these provide the basis for estimating the future educational structure against which future manpower requirements can be compared. On the other hand, if one begins with the 'manpower approach', the corresponding enrolment requirements can be compared with those established by the 'cultural approach'. Increases in planned enrolments over and above those indicated by manpower considerations can simply be added in. In this sense, the 'manpower approach' and the 'cultural approach' are additive.[11]

The Rate-of-Return of Human Capital. It is an accepted proposition in economic theory that the investment in a perfectly competitive economy should be so allocated among various sectors as to equalize the rate of return on capital everywhere. Consequently, the flow of national income over time would be maximized. This principle may be extended to educational planning. If education is an investment in human capital, its rate of return is an indicator for resource allocation.[12] If the rate is relatively high in education, so the argument goes, more resources should be invested in it; if it is relatively low, the scale of educational expenditure should be reduced accordingly.

Eckaus has rightly questioned the validity of the rate-of-return on education as guide for resource allocation. In his words,

> Of course, prices are involved in an essential way both in the estimation of the "human capital" created by education and in the estimation of the rate of return on it. Prices, to be useful in making estimates which can serve as a basis for policy decisions on the allocation of resources, must reflect the relative scarcities of the factors involved . . . . At issue here is whether there are reasonably good prices in the "markets" for education

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[10] Herbert S. Parnes, *Forecasting Educational Needs for Economic and Social Development* O.E.C.D., 1962, 71.

[11] *See* Appendix at the end of the article.

[12] *See*, for example, Theodore W. Schultz, 'Capital Formation by Education', *Journal of Political Economy*, December 1960, 571-83; Gary S. Becker, *Human Capital*. New York, 1964, specially Chap. V. Also relevant are Samuel Bowles, 'The Efficient Allocation of Resources in Education', *Quarterly Journal of Economics*, May 1967, pp. 189-219; and Shane J. Hunt, 'Income Determinants for the College Graduates and Return to Educational Investment', *Yale Economic Essays*, III, Fall 1963, pp. 305-57,

> and educated labour which can be used for valuing "human capital" and its return . . . .
>
> In the estimation of "human capital", a major part of the "investment" costs are conventionally taken to be the expenditures by government on education. It cannot be presumed the value of this "supply" of education reflects the real, relative scarcities of factor inputs determined in reasonably competitive markets . . . .
>
> With respect to the demand for education itself, it is often difficult to identify an effective price for education to which the individual student and his family may be considered as responding. The taxes required to support educational systems are payments fixed irrespective of the "amount" of education taken by a household. It seems quite unlikely that they are ever conceived of as the prices of education, nor would a rational man so consider them.[13]

Apart from the difficulty of estimating shadow prices[14] of education as emphasized by Eckaus, there are other basic problems associated with the use of the rate-of-return as guide for economy-wide resource allocation. The rate-of-return, being a ratio as it is, does *not* take into full account the absolute scales of investment. Nor does it properly discriminate between short-term and long-term achievements.[15] If the-rate-of-return happens to be, let us suppose, 10% for five years in lipstick production as compared to 8% for twenty years in education, this criterion blindly prefers the former.

The Education Commission (1964–66) of India has accepted the manpower-cum-cultural approach as the basis of its educational planning. The fundamental principle of the Commission which guides the provision of facilities at different stages and sectors of education strongly emphasizes free and compulsory education of not less than seven years' duration to every child, and the maximum possible expansion of lower-secondary education.[16] As the Commission puts it: 'The provision of universal primary education is vital on grounds of *social justice* and to help the process of transformation of the national economy'.[17]

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[13] Eckaus, *op. cit.*, pp. 181-82. *See* also H. Correa, *The Economics of Human Resources*, Amsterdam, 1963, 136-38.

[14] Not to mention the controversy in respect of the valuation of students' time as a cost of education. See section on 'Costs of Education' on page 265.

[15] See Ronald N. McKean, *Efficiency in Government through Systems Analysis*, New York, 1958, pp. 25-98.

[16] The *EC Report*, pp. 89-90.

[17] *Ibid*, p. 476. Emphasis added.

On the other hand, the programme of higher education, training and research as recommended by the Commission is by and large related to the manpower requirements of the economy.[18]

Costs of Education

There are three major components of costs of education, namely, (*a*) cost on account of teachers, (*b*) cost of the 'education plant' *i.e.*, buildings, equipment, laboratories, libraries and the like, and (*c*) cost of students' time. The third item is a matter of controversy now.

T. W. Schultz observes that when students go to school or college, they are foregoing the earnings which they might have received in employment otherwise. From the view point of the students as well as the nation, therefore, there is a hidden opportunity cost here.[19] Taking the wage rate of the currently employed persons with a certain level of education as the measure of earnings foregone by a student pursuing the higher level of education, Schultz finds that in the U.S.A. the opportunity cost of the students' time alone is roughly as much as the sum of the other two items of costs of education.[20] With the same methodology, a similar finding for India also has been recently reported—'the importance of earnings foregone in the total costs of education in India ranges from 45% to 55%'.[21]

I have some reservations in this regard. Note that Schultz himself says that the opportunity cost of a student's time is measured by 'what earnings a typical student has been foregoing *at the margin*'.[22] In other words, it is the *marginal productivity* of the student himself in potential employment which is relevant here; *not* the current wage rate as such. Suppose the current employment is *OL*, and the corresponding marginal productivity (wage rate) is *LM* as shown in Figure 1. Let the current enrolment in colleges be *LL*'. Then the *relevant* marginal productivity for calculating the opportunity cost of a student's time is *L*' *M*'; and by no means it is *LM*.

Take the case of India. In 1960–61, the total number of workers with the matriculate level of education was 3,262 thousand, whereas the enrolment in the next higher level of education, namely, intermediate, was 2,351 thousand; the latter is as much as 72% of the former. The enrolment in the under-graduate colleges (581 thousand) was equivalent to 77% of the number of workers with intermediate education (755 thousand); the post-graduate enrolment however amounted to only 6% of the number of workers with graduate degrees. On the whole, the number of students from intermediate to post-graduate colleges in India in 1960–61 was equivalent to 58% of that of workers with the minimum of matriculation education (Table 1). Now it is anybody's guess as to what the marginal productivity would be if all these students take up jobs instead.

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[18] *Ibid*, pp. 89-90.

[19] T. W. Schultz, *op. cit*.

[20] *Ibid*.

[21] V. N. Kothari, 'Factor Cost of Education in India', *Indian Economic Journal*, XIII, April-June 1966, 644.

[22] Schultz, *op. cit.*, p. 575. Emphasis added.

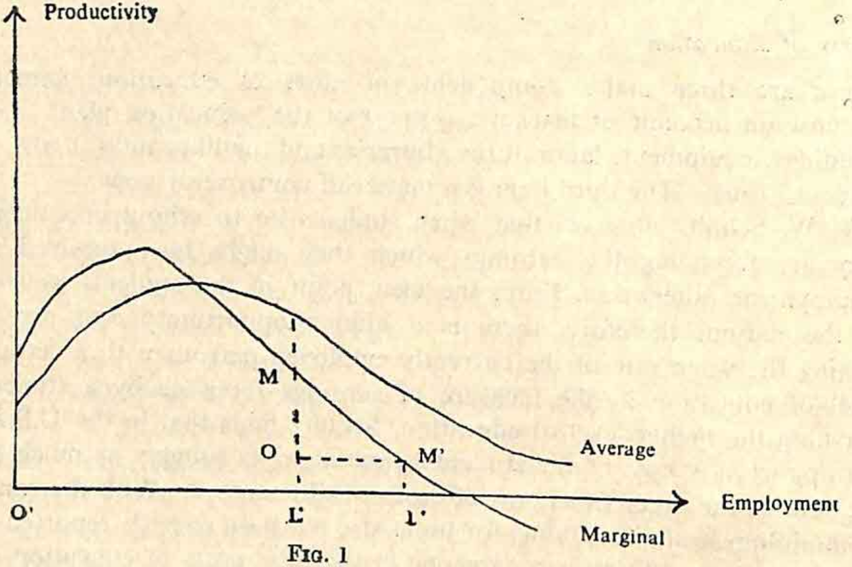

FIG. 1

In India where educated unemployment is such a conspicuous fact, and where many ' young people join secondary schools or colleges . . . .

TABLE 1

NUMBER OF STUDENTS AND WORKERS* IN INDIA: 1960-61 ('000)

		Students		
Symbol	*Intermediate*†	*Under-graduate*	*Post-graduate*	*Total*
S	2,351	581	64	2,996
		Workers		
Symbol	*Matriculate*	*Intermediate*	*Graduate*	*Total*
W	3,262	755	1,146	5,163
S/W	72%	77%	6%	58%

*In agriculture, mining manufacturing, construction, trade and commerce, transport and communications, and services.

†Or higher secondary, i.e., classes XI-XII.

SOURCES: *Report of the Education Commission*, 1964-66, New Delhi, 1966, pp. 94 and 100.

because there is nothing else to do ',[23] the earnings foregone by the student, so it seems to me, is simply zero, if not negative.[24]

The productivity of ' human capital ' is very much a function of the availability of non-human, physical capital. The difficulty with the Schultz-type of human capital approach is that it is essentially based on a marginal and partial analysis which is hardly meaningful for economy-wide general resource allocation.

The Ministry of Education classifies costs under two heads, namely, direct and indirect. Expenditures on buildings, direction and inspection, scholarships, stipends, etc., maintenance of hostels and so forth are called *indirect*, the others being *direct*. The indirect expenses are roughly 25% of the total, while the direct expenses account for the remaining 75%.[25] Of all these, only the expenses on buildings are ' capital ' expenditure; others are ' recurring ' in nature. The capital expenditure on buildings is of the order of only 11% of the total.

Now consider the average annual direct costs per pupil. On the whole, 72% of such direct costs are on account of teachers; the non-teacher costs are only 28%. However, the shares vary considerably as between various categories of education, as shown in Table 2.

TABLE 2

AVERAGE ANNUAL DIRECT COSTS* PER PUPIL: 1965–66

Type of institution	*Teacher costs*		*Non-teacher costs*		*Total*
	Rs.	*Percentage of total costs*	*Rs.*	*Percentage of total costs*	
Pre-Primary Schools	35	64	20	36	55
Lower Primary Schools	27	90	3	10	30
Higher Primary Schools	40	89	5	11	45
Secondary Schools	78	73	29	27	107
Schools for Vocational Education	208	50	208	50	416
Schools for Special Éduation	81	60	54	40	135
Colleges of Arts and Sciences	200	61	128	39	328
Colleges for Professional Education	583	50	583	50	1,167
Colleges for Special Education	245	70	105	30	350
All Types	46	72	18	28	64

*Excluding costs, if any, of the students' time.

SOURCE: *Report of the Education Commission*: 1964-66, New Delhi, 1966, p. 478.

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[23] The *E.C. Report*, p. 98.

[24] In any case, henceforth we are going to ignore the so-called opportunity cost of students time.

[25] The *E.C. Report*, p. 467.

Thus we get the following break-down of the expenditures on education in India.

Capital Expenditure:	
Buildings	11 per cent
Recurring Expenditure:	
Teachers	54 per cent
Non-teachers	35 per cent
TOTAL	100 per cent

The overwhelming preponderance of the recurring expenditures is a notable feature of the education system in India.

Optimum, Minimum or ' Balanced '

It bears repetition that education *per se* is a complicated mixture of consumption and investment. The economists' long search for the *optimal* rates of consumption and investment in a much simpler world with a much simpler commodity has not yet produced any operationally meaningful results. I would be surprised if the economists' analysis alone can do any better with regard to the question of *optimum* investment in education.

The rate-of-return on human capital, as it is being calculated these days, is a very poor guide for resource allocation to the education sector, or within the education sector itself. The demand-for-places approach, on the other hand, though it has a sort of normative air, is also logically unsound for the purpose of resource allocation; since in fact the ' market price ' for education has hardly any intrinsic relation to the corresponding economic costs.

In my view, it is the manpower-cum-cultural approach which provides the clue for educational planning. This, for short, may be called the *balanced approach.* It takes due note of the dual nature of education; and it is designed to ensure inter-sectoral consistency in the economy.

Incidentally, Professor A. K. Sen calls the manpower-need model of Tinbergen-Bos as one of ' minimum ' requirements rather than of ' optimum ' requirements.[26] Because the model as such does not allow substitution possibilities between various categories of educated workers; it belongs to the fixed-requirement type.[27] Nor does the Tinbergen-Bos model, it may be added, incorporate the 'cultural' requirements of education.

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[26] A. K. Sen, 'Comments on the Paper by Messrs Tinbergen and Bos' in C.E.C.D., *The Residual Factor and Economic Growth*, Paris, 1964, p. 197.

[27] *Ibid.*, pp. 191-92.

Here is a field where economic analysis could genuinely contribute to educational planning. We have a large number of studies with regard to capital-labour substitution in production processes.[28] Now the dimension of empirical research has to be expanded so as to consider not just capital on one hand and labour on the other, but capital as well as various categories of educated workers simultaneously. And then we can estimate the optimal manpower requirements to be supplemented with the estimate of 'cultural' requirements for educational planning.

Project Evaluation: Two Examples

The techniques of economic optimization can be used in a variety of cases of evaluating educational projects. Suppose we are considering investment in engineering degree-education and engineering diploma-education; between the two the former is of higher level and more expensive. Let P_1 and P_2 be the prices (costs) of an engineering graduate and an engineering diploma-holder respectively. Suppose also that p_1 is greater than p_2. Now let the production function be given by:

$$Q = f(K, X_1, X_2) \qquad \cdot\cdot \qquad (1)$$

where Q is output, K physical capital, X_1 the number of graduate engineers and X_2 the number of diploma-holder. If f is a continuous and differential function, the marginal rate of substitution between X_1 and X_2 is as follows:

$$-\frac{dX_2}{d\,X_1} = \frac{\dfrac{\partial f}{\partial X_1}}{\dfrac{\partial f}{\partial X_2}} \qquad \cdot\cdot \qquad (2)$$

If Q, K, p_1 and p_2 are given, the minimization of costs requires:[29]

$$\frac{\dfrac{\partial f}{\partial X_1}}{p_1} = \frac{\dfrac{\partial f}{\partial X_2}}{p_2} \qquad \cdot\cdot \qquad (3)$$

Two equations, (1) and (3), together with the given values of Q, K, p_1 and p_2, would determine the two unknowns, namely, X_1 and X_2. Thus the optimal scales of engineering degree and diploma education can be worked out if we know the range of substitutibility between the graduates and the diploma-holder, and the economic costs of their respective education.

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[28] For an interesting recent work see Gerard K. Boon, *Economic Choice of Human and Physical Factors in Production*, Amsterdam, 1964.

[29] Paul A. Samuelson, *Foundations of Economic Analysis*, Harvard, 1947, pp. 60-61.

Let us take another example. There is now a widely held view that the learning process particularly in schools should be accelerated. Machlup,[30] for instance, argues that in the U.S.A. the educational objectives now achieved in 12 years of schooling could be achieved in 9 or 10 years; and this would mean a saving every year of tens of billions of dollars. In India also it is felt that there is much that can be done by lengthening the school day, increasing the number of working days and making full use of the long vacations.[31]

In the words of the Education Commission,

> Since it is very costly to provide and maintain the physical plant of educational institutions, it becomes necessary to utilize it as fully as possible, for the longest time on each day and for all the days in the year . . . . The libraries, laboratories, workshops, craftsheds etc. should be open all the year round and should be utilized for at least eight hours a day, if not longer.[32]

I do not mean to say that there is no under-utilization of our educational plant and the scarce resources engaged in it. I do agree that we must use them as efficiently as possible. However, we cannot afford to forget that an increase in the rate of utilization of the education plant without lowering the standard of education may involve a concomitant rise in the operating or recurring expenses, in the form of more salary to teachers, higher rate of depreciation and so on. If so, there is a scope for economic optimization.

Suppose that the number of students to be *finally* ' graduated ' every year is given to be X; the period of study under the system is T years;

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[30] Fritz Machlup, *The Production and Distribution of Knowledge in the United States*, Princeton, 1962, p. 133.

[31] 'There is considerable variation, from area to area, in the total number of working days in a year—these range from 172 to 309 at the school stage and from 120 to 240 at the university stage. The number of holidays given within a school year shows even larger variations—from 20 to 75 at the school stage and from 4 to 49 at the university stage. Similarly, the total duration of vacations varies from 36 to 84 days at the school stage and from 62 to 137 at the university stage. The days utilized for examinations (inclusive of preparatory leave) vary from 10 to 77 and the loss on account of celebrations such as foundation days, annual function of societies, etc., is sometimes as high as 40 to 60 days in a year. The facts are a sad reflection on the efficiency of the educational system; and the general under-utilization which they represent in a developing economy like ours is tantamount to an upardonable waste of scarce resources'. *The E.C. Report*, p. 38.

[32] *Ibid.*, p. 40.

and the uniform rate of drop-out due to failure, etc., is λ. Then the scheme of enrolment is as follows:

a Year of Education:	1st	2nd	3rd	...	$(T—2)$nd	$(T—1)$st	T—th
b Flow of Enrolment:	y	$(1-\lambda)_y$	$(1-\lambda)^2y$	...	$(1-\lambda)^{T-3}y$	$(1-\lambda)^{T-2}y$	$(1-\lambda)^{T-1}y$
	$\downarrow$	$\downarrow$	$\downarrow$		$\downarrow$	$\downarrow$	$\downarrow$
c Flow of successful students:	$(1-\lambda)y$	$(1-\lambda)^2y$	$(1-\lambda)^3y$	...	$(1-\lambda)^{T-2}y$	$(1-\lambda)^{T-1}y$	$(1-\lambda)^Ty$

Now put $(1-\lambda)T_y = 1$. Then to produce a stream of one ' final graduate ' per year, the total enrolment per year is given by:

$$\left[\frac{1}{(1-\lambda)} + \frac{1}{(1-\lambda)^2} + \frac{1}{(1-\lambda)^3} + \cdots + \frac{1}{(1-\lambda)T} = \frac{1}{\lambda}\left[\frac{1}{(1-\lambda)}T-1\right] = k \quad \text{(say)}\right.$$

$$(0 \leqq \lambda \angle 1) \qquad .. \qquad (4)$$

Furthermore, suppose the ' operating cost ' of the education plant is denoted by C per year per student enrolled.

Now consider an alternative scheme of accelerated education where the period of education, call it T', is shorter; $T' \angle T$. Consequently, we get a lower value of k for this scheme; call it k'; obviously $k' \angle k$, However, the operating cost per year per student enrolled is now higher; $C' > C$.

With the discount rate r, the present value of the total operating costs of producing a ' graduate ' is given by:

$$C\left[\frac{1}{(1-\lambda)^T}\cdot\frac{1}{(1+r)} + \frac{1}{(1-\lambda)^{T-1}}\cdot\frac{1}{(1+r)^2} + \frac{1}{(1-\lambda)^{T-2}}\cdot\frac{1}{(1+r)^3} + \right.$$
$$\left. + \frac{1}{(1-\lambda)}\cdot\frac{1}{(1+r)^T}\right]$$

in the former system of education, and by:

$$C'\left[\frac{1}{(1-\lambda)^{T'}}\cdot\frac{1}{(1+r)} + \frac{1}{(1-\lambda)^{T'-1}}\cdot\frac{1}{(1+r)^2} + \frac{1}{(1-\lambda)^{T'-2}}\cdot\frac{1}{(1+r)^3} + \right.$$
$$\left. + \frac{1}{(1-\lambda)}\cdot\frac{1}{(1+r)^{T'}}\right]$$

in the latter, accelerated system. The marginal rate of return, r, on investment in the accelerated system then can be solved from the following equation:

$$C \sum_{\substack{t=T \\ S=1}}^{\substack{S=T \\ t=1}} \frac{1}{(1-\lambda)^t}\cdot\frac{1}{(1+r)^S} = C' \sum_{\substack{t'=T' \\ S'=1}}^{\substack{S'=T' \\ t=1}} \frac{1}{(1-\lambda)^{t'}}\cdot\frac{1}{(1+r)^{S'}} \qquad .. \qquad (5)$$

If r is higher than, or equal to, the opportunity cost of capital in the economy, it is *economically* justifiable to introduce the accelerated system of education; otherwise not.

It is possible to find many other occasions in the process of educational planning where economic analysis can come to considerable help without violating the restraints of social, political and cultural values.

APPENDIX

An Input-Output Model for Educational Planning

Suppose there are n categories of education such as primary, secondary, general graduate and post-graduate, medical, engineering and so on. To begin with, each category has one productive 'activity'. An activity uses students as current inputs and teachers as capital inputs; and its output is 'educated' students.

The output of an activity partly flows down to other educational activities to provide student-inputs, and also to some other such activities to provide the teacher-inputs there. The third stream of the output of an activity flows to the labour market for gainful employment; the fourth stream ends up in involuntary unemployment, while lastly the fifth stream accepts voluntary unemployment such as 'housewife', etc. If X_i is the output of activity i, and x_{ij}, z_{ij}, l_i, u_i, and v_i are the above mentioned five flows respectively, then we get:

$$X_i = \sum_{j=1}^{n} x_{ij} + \sum_{j=1}^{n} z_{ij} + l_i + u_i + v_i \quad \ldots \quad (6)$$

Generally, $x_{ij} > 0$ implies that $x_{ji} = 0$; in other words, if activity i sends its finished product as student-inputs to activity j, the latter does not send such inputs back to the former. Again, $x_{ij} > 0$ implies that $z_{ij} = 0$; to put it differently, if the output of activity i is a student-input in j, then the former cannot be a teacher-input in the latter. Thus, in fact many of the elements of x_{ij} and z_{ij} are zero.

As shown above in the text, if the period of production of activity i is T_i years, and λ_i is the uniform rate of drop-out every year, then to maintain a stream of one finally 'educated' student per year, the total enrolment per year has to be:

$$k_i = \frac{1}{\lambda_i}\left[\frac{1}{(1-\lambda_i)T_i}\right] \quad \ldots \quad (7)$$

Thus the student-input per unit of student-output being given by k_i, we get:

$$k_i = Y_i/X_i \quad \ldots \quad (8)$$

where X_i is the volume of output, and Y_i the required current input, *i.e.* enrolment in activity i.

We assume that:

$$x_{ij} = a_{ij} Y_j \qquad .. \qquad (9)$$

Therefore, in view of (8) and (9), we get:

$$x_{ij} = a_{ij} k_j X_j \qquad .. \qquad (10)$$

Here a_{ij}, *like* k_j, is a parameter.

The flow of teachers is related to the *change* in student enrolment and 'depreciation' in the stock of teachers due to retirement, etc. Suppose Z_i is the stock of teachers with the level of education i; and suppose θ_i is the rate of depreciation.[33] Then we get:

$$z_{ij} = l_{ij} \triangle Y_j + \theta_i l_{ij} Y_j \qquad .. \qquad (11)$$

where l_{ij} is the relevant teacher-student ratio. Note here that $(l_{ij} Y_j)$ is the stock of teachers with educational level i engaged in teaching in activity j.

Then l_i is the component of the output of education i which goes to the labour market; this component has to be exogenously given to the model. The requirements of workers with education level i in industry, agriculture, trade, commerce, services, etc., have to be carefully projected keeping in view the pace and pattern of economic development.

The next component, namely, involuntary unemployment, u_i, is a matter of policy decision. What is the tolerable level of u_i cannot be answered on economic considerations alone; social, political and cultural factors also have to be taken into account. So for this model u_i is also an exogenous variable.

As for v_i, we may take it to be a fixed percentage of X_i, although the fact remains that it is extremely difficult to distinguish between voluntary and involuntary unemployment. In any case, let us suppose:

$$v_i = \sigma_i X_i \qquad .. \qquad (12)$$

Thus finally we have the following system of equations:

$$X_i = \sum_{j=1}^{n} a_{ij} k_j X_j + \sum_{j=1}^{n} l_{ij} k_j \triangle X_j + \sum_{j=1}^{n} \theta_i l_{ij} k_j X_j + l_i + u_i + \partial_i X_i \qquad .. \qquad (13)$$

$$i = 1, 2, 3, \ldots, n.$$

Given the values of l_i, and u_i and the parameters of the system, the flow patterns of enrolments and of the students at various levels of education can be worked out from (13).[34*]

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[33] Sen has some objections to such a flat rate of depreciation irrespective of the age-structure of the stock of teachers. He suggests a more complicated method in the course of his comments on the Tinbergen-Bos model. Sen, *op. cit.*, p. 190. Sen's method has been used in the education planning for Spain. *See* L. J. Emmerij, 'Planning Models for the Calculation of Educational Requirements for Economic Development in Spain', in O.E.C.D., *Econometric Models of Education*, Paris, 1965, p. 37.

[34] The activity of primary education derives its students from outside the system where, by assumption, there is no supply bottleneck.

Chapter Twenty-One

Investment Effectiveness and Educational Planning in India

V. B. SINGH and T. S. PAPOLA

Economists, in the past have been interested in education mainly due to its powers to enhance workers' skill, dexterity, intelligence, varied aptitudes and give a free scope to their natural and acquired abilities.[1] With the revival of interest in economic development, the economists have rediscovered education as a major source of economic development; and have designated the expenditure on education as investment in human capital. On theoretical grounds, one may be sceptical about the application of purely economic terms in the context of education,[2] but because of empirical evidences of the growth potential of education, such objections have been ignored.

Investment Effectiveness

Since expenditure on education has been treated, both on theoretical and empirical grounds, as an investment in human capital, a capital-scarce developing economy has to allocate rationally its investible funds with a view to maximizing the effectiveness of investment. One of the implications of this statement is that the effectiveness of investment in human capital (education) is to be evaluated *vis-a-vis* investment in material capital on the one hand; and, a comparative view of the effectiveness of investment in different types of education has to be taken, on the other. There are methodological as well as practical difficulties associated with this approach. The economic criterion for judging investment effectiveness in the present structure of Indian education is not sufficient because of its large consumption-component. The scientific application of the measure of investment effectiveness implies the reorientation of the educational system to maximize its investment-component. Viewed thus, evaluation of investment effectiveness of outlays on education may be attempted on the basis of any of the following two approaches: (1) Contribution of education to Gross National Product and (2) Financial returns from education.

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[1] Cf. V. B. Singh, 'Economic Aspects of Education', in his *Essays in Indian Political Economy*, Delhi, 1967. See also B. F. Kiker, 'The Concept of Human Capital in the History of Economic Thought', *Indian Economic Journal*, January-March 1967.

[2] H. G. Shaffer, 'Investment in Human Capital: A Cement', *American Economic Review*, December 1961, pp. 1026-1035.

Recently, some attempts have been made, particularly in the U.S.A.[3]; for measuring the contribution of education to economic development. It has been estimated that education contributed to the growth of per capita real national income, during 1929–57, to the extent of 42 per cent.[4] Another estimate for the period 1900–1956, revealed that the contribution of education to growth of national output has been 350 per cent higher than that of investment in material capital.[5] These conclusions are highly revealing in spite of their well-known methodological weaknesses which emanate from the fact that either the ' residual ' (inexplicable in terms of the growth of tangible factors of production) is simply summed up as the contribution of ' human capital ' or education; or a correlation analysis is used to establish a causal relationship between educational expenditure and economic growth.

The second approach, based on the calculations of the rate of returns to investment in education, treats education as a means for increasing the earning capacity which in turn, may be accompanied by an increase in productivity as well. The realistic assumption behind this approach is that differences in the earnings of individuals, more or less, reflect the differences in educational abilities, arising out of the differences in the investment in their education and training. Obviously, in cases where a large part of earning-differentials are in the forms of rents of (inherited) ability and/or rent of scarcity, the assumption may not hold good and limit the usefulness and validity of the rate of returns approach. Yet as a first approximation to the measure of productiveness of investment in education, this method has been adopted by some economists.[6]

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[3] See for example, T. W. Schultz, 'Education and Economic Growth' in Nelson B. Henry (Ed.), *The Sixtieth Yearbook of the National Society for the Study of Education*, 1961, p. 60; E. F. Denison, 'The Source of Economic Growth in the United States and the Alternative before U.S.', 1962, O.E.C.D. Supplementary Paper No. 13; Hector Correa, *The Economics of Human Resources*, Amsterdam, 1962.

[4] E. F. Denison, 'Education, Economic Growth and Gaps in Information', *Journal of Political Economy* Supplement, Vol. 70, No. 5, Part 2, October 1962, p. 127.

[5] T. W. Schultz, *op. cit.*, p. 60.

[6] See, for example, G. S. Becker, *Human Capital*, New York, 1964, T. W. Schultz, *op. cit.*; H. S. Houthakkar, 'Education and Income', *Review of Economics and Statistics*, Vol. 41, No. 1, February 1959; E. F. Reinshaw, 'Estimating Returns to Education', *Review of Economics and Statistics*, Vol. 42, No. 3, August 1960; Jacob Mincer, 'On the-Job-Training: Costs, Returns and Some Implications', *Journal of Political Economy* (Supplement), Vol. 70, No. 5, Part 2, October 1962; W. Lee Hansen, 'Total and Private Returns to Investment in Schooling', *Journal of Political Economy*, Vol. 71, No. 2, April 1963.

There may be private as well social returns from investment in education. While in macro-economic analysis both these returns for the economy would be equal, there is no reason why they should be equal in micro-economic analysis of a unit of investment in the case of an individual. The benefit that the individuals derive in the form of higher earnings from education may not necessarily be the same as the benefits derived by the economy as a whole. Further, in the calculation of the private and social rates of returns, the costs, on which the returns are calculated as a percentage, are also different, particularly when a larger part of education and training is provided by the State. In either cases of returns, however, there are difficulties involved in calculation. The analysis has, therefore, generally confined itself to income-flows and costs that can be reasonably identified. The rates of return, which are thus calculated by finding a rate of discount, which will tend to equalize the present value of additional income-flows and the value of cost outlays, may be of particular value in planning investment in education.

Rate of Returns in India: Three Estimates

In spite of the paucity of data, some pioneering attempts have been made to calculate the rates of returns on education in India. Each successive attempt has improved upon the preceding estimate through certain methodological innovations. But this may also impose limitations on the validity of comparisons between the results of these studies. For ' what ' is being calculated may be different at different times, and ' how ' it is being calculated differs every time.

First, an attempt to evaluate the economic rate of return of investment in education was made by Arnold C. Harberger.[7] The basic data used in this study are from *A Socio-Economic Survey of Hyderabad* conducted by the Indian Institute of Economics (Hyderabad). Harberger estimates the rates of returns on Secondary and Higher education on the basis of age-education-earnings profile. The returns have been calculated on two different assumptions: Assumption I taking direct costs of each stage of higher education as an increasing percentage of the earnings of ' a primary school graduate ' starting at the age of 14 and increasing by one year at every stage; and Assumption II taking the direct costs of education as 50 per cent of foregone earnings.[8]

The findings are: (1) On Assumption I, the rates of return of higher (graduate, post-graduate), as compared with primary, education were

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[7] Arnold C. Harberger, 'Investment in Men *Versus* Investment in Machines: The Case of India', in C. Arnold Anderson and Mary Jean Berdman (Eds.), *Education and Economic Development*, Chicago, 1965, pp. 11-50.

[8] *Ibid.*, p. 25.

15 per cent; and as compared with secondary education were 16·9 per cent; and those of secondary as compared with primary education were 11·9 per cent. (2) On Assumption II the corresponding rates of return were 14·1, 16·3 and 10·0 per cent, respectively.

Another attempt was made by V. N. Kothari in a paper[9] submitted to the Seminar on Investment in Education organized by the Department of Economics, Lucknow University, Lucknow, in February 1966. The data have been taken from the *Report on the Economic Survey of Bombay City*, conducted by the Department of Economics, Bombay University. Certain missing clues like the age-specific earning data for each educational level have been estimated by the author himself. Following, in general, Harberger's methodology based on age-qualification-specific-earnings profile, Kothari has calculated the rates of return on education for the High School, all Graduates, Arts and Science graduates and Technical and Engineering graduates. The social monetary rates of returns for these four types of education have been calculated at 20, 13, 10 and 22 per cent, respectively and the private monetary rate of returns for college education is estimated at 14 per cent, and that for technical and engineering at 25 per cent.

In the same Seminar, another attempt was made by Ishrat Z. Hussain[10] by way of verification of a hypothesis that there is a positive association of total and differential returns with different levels of education. In the absence of adequate data relating to life time earnings, the writer has adopted the device of discounting the average earnings per year by loss of many years due to mortality throughout the working age span. Certain analytical devices, like assuming the average earning for each level of education as equal to the earnings in the seventh year after completion of education; subsequent increase in earnings being assumed due to experience and not due to education, and deduction on account of incidence of unemployment, have been adopted.[11] She has then calculated cost—both direct and indirect, the latter being taken as earnings foregone during the education period beginning at the age of 15 or after matriculation. After accounting for an 8 per cent rate of interest on cost of education, she has estimated the rates of net returns to total costs, which are 37 per cent for matriculates, 4 per cent for all graduates, 3 per cent each for post-graduates (general) and professional graduates. With regard to differential net returns 'which may really be taken to be net returns to the economy', the writer finds that they are ' negative in case of graduates and post-graduates and positive only for professional graduates '.[12]

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[9] V. N. Kothari, 'Returns to Education in India', in Baljit Singh (Ed.), *Education as Investment*, Meerut, 1967, pp. 127-140.

[10] I. Z. Hussain, 'Returns on Education in India: An Estimate', in Baljit Singh, *op. cit.*, pp. 141-156.

[11] *Ibid*, pp., 142-143.

In spite of the differences in methodology, coverage and findings, the three studies on India reveal certain general conclusions: (1) The returns on College education in India varying between 4 per cent (Hussain—all graduates) to 10 per cent (Kothari—Arts and Science graduates) are lower than that of 14·8 per cent of the U.S.A.[13] for 1958. (2) The rates of return are high for Matriculates, varying from 20 per cent (Kothari) to 37 per cent (Hussain); low for general graduates (as given in (1) above); and high in case of professional graduates (22 per cent—Kothari). The net returns to the economy are found to be positive only in case of professional graduates (Hussain). (3) The rates of return on education are found to be lower than those on physical capital (Harberger).

Implications for Educational Planning

In this concluding Section we propose first, to diagnose the educational malady reflected in the symptoms discussed above; and, then draw certain policy implications for planning investment in education and its sub-sectors.

The relatively low rate of return on investment in education may be analysed in terms of an examination of a set of hypotheses. (1) We have invested relatively too much in education; and consequently, its marginal rates of returns have sharply declined. (2) There is huge wastage in education. A large percentage of expenditure is not properly channelized to be converted into investment. The leakages are too many and too wide. (3) Bulk of our investment in education has gone into such sub-sectors as have inherently a low potential for yielding returns.

We reject the first hypothesis because of the exceptionally high percentage of illiteracy prevailing in the country; and the relative poor performance of the average educated cadres compared to their counterparts in the matured economies. We assume that the poor performance is due to lack of proper educational facilities which are a function of per capita educational expenditure. Our contention is proved by the fact that public expenditure on education in India is merely 2 per cent of the national income as compared to 5, 4 and 6 per cent in the USA, the UK and the USSR, respectively.

We find our second hypothesis to be valid. Taking intake-out-turn ratio as a single indicator, we find that the out-turn of degree courses has been about 50 per cent ot intake, and that for diploma courses still lower.[14] The average degree of effectiveness of investment on the education of degree and diploma holders further declines on account of the widespread incidence of educated unemployment.

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[12] *Ibid*, p. 167.

[13] G. S. Becker, *op. cit.*, p. 128.

[14] I.A.M.R., *Factbook on Manpower*, New Delhi, 1963.

Our third hypothesis also seems to be valid. We have seen above that the rates of return on different types of education substantially differ. It seems that we have invested more on the types (general college education) with lower rates of return than on those with a high rate of return (matriculates and professional graduates). The average arts graduate (and sometimes postgraduate) seek clerical jobs for which education upto matriculation is the warranted necessary qualification. In other words, expenditure incurred on college education for clerical jobs is a sheer waste. It is common place that our educational system suffers from the malady of excessive University enrolments in unproductive educational sub-sectors,[15] which in fact, hampers economic development in so far as scarce investible funds have been misemployed. The percentage enrolment in the branches of humanities (not including social sciences) is about 52 per cent in India as compared to a negligible percentage in the USSR; 15 per cent in Japan and 31 per cent in the United Kingdom. In contrast, our enrolment in agricultural courses is merely 1·2 per cent as compared to 11·5 per cent in the USSR and 4·5 per cent in Japan.

Therefore, it is imperative that the wastage involved in education, both during and after the completion of courses, be minimized and investment in education be allocated on the strict criterion of investment effectiveness. The latter point may lead to an emphasis on adult-education—a subsector almost neglected in India. We are aware of the non-economic factors determining the pace and pattern of educational expansion in the country. But in the larger interest of economic development it is necessary that some economic criterion like the rates of return, in spite of its limitations, be adopted as the basis for allocating investment in education.

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[15] V. K. R. V. Rao, *The Role of University in a Developing Society*, Delhi, 1964, p. 5.

Chapter Twenty-Two

Returns Approach to Educational Planning

DR. (MISS) I. Z. HUSSAIN

The recent interest in educational planning follows as a result of the various developments in this sphere including huge public investment expenditure involved in it, the recognition of contribution of educated labour force to economic growth, attempts to its quantification[1] and the disequilibrium in the market for educated labour force revealed openly by incidence of unemployment. The important issues to be decided in this context are: (i) Should educational planning proceed on the basis of balanced or unbalanced growth? In other words is there a possibility of dynamic equilibrium in the stock and flow of the number of persons educated and jobs created appropriate to each educational level and type? (ii) What instruments of educational planning are available and how far they bring equilibrium in the market for educated manpower? (iii) Can educational planning proceed on a single such instrument or criterion or is a multi-criteria approach necessary? Can these criteria be applied for decisions on all levels and types of education? (iv) What are the strategies of educational planning and how far the existing techniques are satisfactory in taking a decision on it.

Balanced and Unbalanced Growth

The possibility of a balanced growth or achievement of dynamic adjustment in the stock and flow of manpower demand and supply is altogether denied by some economists. It is argued that manpower supply is subject to cobweb effect without any tendency to converge to equilibrium due to long 'lead-time' in the availability of highly qualified manpower. An excess demand of a special skill will raise the earnings and thus enrolment in that particular area turning the existing shortages, after five or six years into glut. A fall in earnings reflecting the excess supply at a particular time has the reverse effect. Thus there are cycles of excesses and shortages of qualified manpower at different time as the dynamic adjustment process may never clear the market in any period.[2]

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[1] E. F. Denison, 'Measuring the Contribution of Education (and the Residual) to Economic Growth in O.E.C.D.'. *The Residual Factor and Economic Growth*, Paris, 1964.

Another approach is to create deliberate excess of social overhead capital including education. Development via excess supply of such capital is expected to create demand for these services by inducing the directly productive investment. It is argued that the experience of unbalanced growth in the past is that it produces at an advanced stage of economic development the possibility of balanced growth.[3] In a similar strain Lewis pointed out that a surplus of educated persons can only be a temporary phenomenon since an economy can ultimately absorb any number of educated persons by reducing the premium on education and raising the educational qualification for the jobs.[4]

The conclusion which can be drawn from such approaches is that an excess of strategic manpower is not only inevitable but has a healthy impact on the economy.

The balanced growth approach is the application of ' systems analysis to human resource development planning '. The various constituent elements of human resource development like skill-generating centre and employing organisation are looked upon as a system which is somewhat analogous to a system for the generation and distribution of electric power. A system of human skill generation should be designed to carry varying loads; it must have built-in-flexibility to meet such loads; it must be adequate in size; and above all its components must be properly balanced. The manpower problems encountered by developing countries such as skill shortages and labour surpluses may be thought of attributable to power failures in particular generating centres, ineffective linkages between these centres, or faulty design which results in the failure of the total system to carry the loads expected of it.[5] The educational planning should therefore aim at balancing of stock and flow of educated manpower and job requirements. It brings us to the question of availability of instruments for the purpose.

Instruments of Educational Planning

Each one of the existing instrument or criterion for educational planning is based on the assumption derived from economic theory. The social demand criterion assumes the operation of the Say's Law in the market for educated manpower. Absorptive capacity of the economy is supposed to be perfectly elastic. What is required is the estimation of demand for education by individuals by the extrapolation of past enrolment trend with fixed cost of education or by estimating the price elasticity with changes in cost. The manpower forecast approach, on the other hand, projects the absorptive capacity and assumes the supply to catch up with the demand in the Keynesian tradition. Forecasting of manpower requirements or of absorptive capacity is based on the projections of GDP estimation of technical manpower coefficients and conversion of derived occupational composition into educational structure.

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[2] M. Blaug, 'Approaches to Educational Planning,' *The Economic Journal, June*, 1967.

[3] A. O. Hirschman, *The Strategy of Economic Development*, Yale, 1958, pp. 89-93.

[4] W. A. Lewis, *Development Planning*, Allen and Unwin 1960, pp. 104-110.

[5] F. Harbison, *Educational Planning and Human Resource Development*, UNESCO, 1967, p. 26.

A third instrument of educational planning dealing with the problem at a three dimensional level of matching the supply and demand of educated manpower at a particular level of earning is the returns criterion on cost of education. It derives its support from the profitability theory and investment. It is often stated that these three approaches are competitive and the application of one rules out the other two. It is, however, not correct as, Blaug has very cogently pointed out the complementarity of these approaches which when applied together can act as the cross-check. He states that: If the demand for educational inputs depends in any way on its price, and this will necessarily be so if there is any substitutability between educational inputs, changes in supply are just as capable of altering that price as changes in demand, and, therefore the quantity demanded of educational inputs is not independent of its supply. It follows that manpower forecasts must always be combined with social-demand projections. Similarly, social-demand projections by themselves are not a safe basis for educational planning. The tendency to upgrade skill-requirements when the labour market becomes favourable is a well-attested phenomenon.[6] It seems to have definite limits, however, as we witness the incidence of ' intellectual unemployment ' in many countries. As we combine forecasts of demand with projections of supply, we start thinking quite naturally of earnings associated with education as indicators of impending shortages and surpluses. And since the costs of training of various types of specialized manpower differ considerably, we will have to consider variations in earnings in relation to variations in the costs of education. This is rate-of-return analysis, whether we call it that or not. By making such calculations on a year to year basis, we keep a continual check on labour makets for highly qualified manpower and gradually develop insights into the ways in which education interacts with economic growth.[7] It is abundantly clear that no educational planning is complete without reference to earning and cost of educated manpower and therefore returns criterion has to be utilized. The question is whether return is a satisfactory instrument when applied in isolation or has it to be used in conjunction with other criteria? There are obvious limitations of return criterion for educational planning *hence* the necessity for the multi-criteria approach. At the same time it has to be remembered that the criterion of social demand as well as manpower planning have serious limitations where education is heavily subsidized and where labour coefficients are subject to change.

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[6] J. K. Folger and C. B. Nam, ' Trends in Education in Relation to Occupational Structure', *Sociology of Education*, Fall 1964, pp. 19-34.

[7] *Op. cit.* p. 286.

Assumptions and Limitations of Returns Application

The returns approach to educational planning is based on the following assumptions:

i. Existing earning differentials of educated over uneducated and of various categories of education reflect the productivity differentials.
ii. The marginal returns correspond to average returns.
iii. Direct and indirect non-monetary and indirect monetary benefits of education can be ignored.
iv. The direct and opportunity cost of education can be measured satisfactorily.

The returns approach to educational planning is criticized mainly for its assumption which may not hold good and vitiate the results. The crux of the problem is whether wages equate marginal productivity or not. If there is no relationship between productivity and earnings the whole theory of expenditure on education as investment breaks down. Any economic system guided by the profitability criterion in projects at the micro level cannot go ahead with the payment of earnings at a level higher than the productivity of workers save for temporary periods. The extra allowances given to compensate for the rise in prices to worker of different categories at varying rate may of course affect the differential returns. But the wide divergences in this respect cannot entirely be explained by differential payments of allowances.

For planning purposes it is assumed the marginal returns are more important than average and the two may not be the same for a long period. It is true, if cost and earnings are changing at different rates in future, which is quite likely, the marginal returns will diverge substantially from average. But two factors have to be taken into account here. Firstly, returns can only be instrument for short term planning and therefore, this method is more suitable for countries having a short lead-time in education. In other words, educational system where specialization starts late and is of short duration the return approach is particularly suitable. In fact, late specialization is suited particularly in a developing country with fast changing technology. Secondly, the returns calculated with the present method are marginal with respect to level of education as differential earnings are taken into account for each additional dose of education. The marginal returns associated with the addition of qualified manpower can be estimated at different time periods by taking into account the earnings of each cohort completing a particular level of education.

The third limitation of exclusion of direct non-monetary and indirect monetary and non-monetary benefits is shared by other instruments of educational planning as well. Moreover, through refinements in return approach there is a possibility of including such benefits with imputed values.

There cannot be any controversy regarding the direct and indirect cost calculation for each level of education though the data are lacking for the maintenance and other expenditure during the period of education. Similarly it is doubtful whether earnings foregone are to be taken into account or not particularly in a country with huge unemployment.

An operational limitation of returns approach for educational planning follows from its nature rather than assumptions. It only shows the direction of investment but does not indicate the exact magnitude by which the investment has to be reduced or expanded like the other two approaches. In the application of cost-benefit ratio the allocation of resources is guided by the comparison of yield or returns. Moreover, it provides a clue for probing into the marked differential returns associated with different types of education. In a pure competitive system the cost-benefit ratio of all types of education should be the same if it is assumed that (i) a higher level of education increases productivity *pari passu* and (ii) earnings correspond to productivity differentials as this is the rationale behind the returns approach. Marked divergence in returns do indicate the relative imbalances in the expansion of education. In any case, due to the imperfections of the market, as well as, due to subsidised public education the returns criterion can seldom be used in an exclusive manner.

Methodology for Calculating Returns

The purpose as discussed earlier for calculation of returns is (i) to compare the yields in alternative lines of investment and (ii) to compare the returns within the educational set up in different lines and at different stages. The two by themselves cannot be a guide to educational policy. Yet it can act as a diagnostic test for ills in the economy where exact nature can be ascertained by other methods.

Like the calculation of returns on any other asset two types of information are required for investment in human capital namely (i) the total cost in creating the asset and (ii) total returns over the life span of this asset.

Cost. The cost is divided into two types direct and indirect cost. Direct cost has two components: (i) public cost or public expenditure on education at each level, (ii) private cost which consist of expenditure on fees, books and additional expenses by way of clothing, travel, hostel and pocket money. The latter does not include the maintenance cost which would have been incurred in any case. The indirect cost is the earnings foregone for the number of years spent in attaining each particular level of education taken at the rate of average earnings with previous completed level of education. Upto high school no indirect cost need to be imputed as they do not enter the labour force just upto that age. Earnings foregone during the period of education would have yielded a rate of interest had these been invested elsewhere. These may be taken at the market rate of interest of 6% and added to the indirect cost. But the rate of interest on total cost including the direct cost has in our calculation been deducted from the earnings stream rather than added to the cost. A further refinement is to add the interest rate on direct cost for the number of years of schooling which has not been attempted here.

Earnings. Instead of the usual method of estimation of life time earnings we have taken the average monthly income of the earners as reported in a survey at a particular time in all age-groups.[8] Therefore, it amounts to cross-sectional rather than over-time analysis. Actually, a better method is to take the earnings, say, after seven years of completed education at each level. It will reflect the earnings only due to education and would not average out the increments due to experience.[9] The returns calculated on the earnings of synthetic cohort will, therefore, have a bias on the higher side due to the non-inclusion of earnings and experience. Three types of returns are calculated.

i. *Gross Yearly Returns.* The average earnings corrected for the leakages due to unemployment and mortality over the earnings of uneducated represent the gross yearly returns. Since the average expectation of life at age 15 with present mortality schedule in India is about 40 years the deductions due to mortality are assumed to be negligible. Leakages due to unemployment are calculated by assuming the rate of unemployment to be 13% for matriculates, graduates, post-graduates and professionals in law and education and about 2% for professionals in engineering and medicine. Actually, the incidence of unemployment would be much higher than revealed by different surveys. After three or four years of completed education a person does start some work, however, unsuitable it may be for his qualification. Moreover, the man years lost for freshers would be much higher. The difference between average earnings and gross returns would indicate the loss due to unemployment.

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[8] P. D. Shrimali, *Pattern of Employment and Earnings Among Graduates in Lucknow*, Labour Research Centre, Deptt. of Economics, Lucknow University, 1967.

[9] This method was adopted in earlier paper on 'Returns to Education India', Singh, B. (ed.), *Education as Investment*, Meerut, 1967.

The differential gross return represent the differences of earnings at higher level of education over that of matriculates.

ii. *Net Yearly Returns.* Further deduction from gross returns are made for (*a*) replacement cost, (*b*) yearly interest on total cost and (*c*) obsolescence which has not been calculated. It gives us the net returns which can be calculated on all types of cost. The limitation of this method could be that for private returns deduction should not be made for replacement. Its deduction is necessary due to the social cost component contained in replacement. Therefore, rate of return on private cost will be a little higher than revealed due to this deduction. Net differential returns are the gross differential returns minus deductions for these items.

iii. *Rate of Returns.* Rate of returns are calculated with reference to (i) gross yearly return, (ii) differential gross returns, (iii) net yearly returns and (iv) differential net yearly returns on (*a*) private cost, (*b*) public cost, (*c*) total direct cost and (*d*) total direct and indirect cost.

The following results are evident from the Table 1, which appears at the end of this paper.

Rate of Gross and Net Returns

The rate of gross yearly return on public cost is substantially high at about 4 per unit of investment in matriculates, graduates and doctorate while it is as low as about 1 per unit of investment in agriculture, medicine and engineering graduates. In between falls post-graduate education with a return at about 2 per unit of investment. The rate of return is much lower on private cost and varies from 0·7 on doctorate and matriculation to 0·23 on professional education due to its heavy component in total cost. The relative position of rate of return on post-graduate science, engineering and medicine on private cost is higher than on public cost due to large government expenditure involved in such education. The yield falls further on total cost including the indirect cost. Highest rate of return at 0·56 is obtained on matriculation and the lowest at 0·03 and 0·09 on education, agriculture and commerce. Rates of gross returns are almost the same for arts and science graduation, post-graduation in science and doctorate at 0·16 followed by engineering and medicine at 0·14.

Rate of net return is obviously lower on all types of education than gross return but the relative position of rates of return on various types is almost the same as of gross returns. It reveals that variations in costs strongly influence the rate of return on higher education. In other words earnings do not increase in the same proportion as cost of education at higher levels.

Differential Rate of Gross and Net Returns

As matriculation represents a basic stage for advance education of different types the differential return have been calculated for higher stages of education over the rates of returns for matriculation. The rate of differential return shows the advantage at each higher level of education over matriculates. Rate of differential gross return on public cost is highest, at more than 4 per unit of investment for Ph.D. and graduation in arts followed by graduation in science and commerce and post-graduation in science. But on private cost the rate of return is highest on post-graduate science education. The next in order is professional education in medicine, engineering and law. The lowest rate of differential return on private cost is indicated on education and post-graduate and graduate commerce education. The position is almost the same on total cost.

The rate of differential net returns also shows the same pattern but there are negative returns on certain types of education. For example, rate of differential net returns are negative on all types of cost for undergraduate and post-graduate commerce and post-graduate arts. In professional education it is negative for education and agricultural science and extremely low for law. Highest positive differential rates of return on total cost is obtained on doctorate followed by medicine, engineering and post-graduate science.

A few broad conclusions may be noted:

a. Upto matriculation the rates of return are extremely high. This is to a certain extent due to the non-competitive market in which the educated persons sell their services. But beyond this stage the rate of return over total cost is seldom higher than 10% and is less than 5% for post-graduate commerce education (3%), a degree in agriculture or education (2%) or for post-graduate arts education (0·3%)

b. The rates of net returns on public cost are more than 20% in case of general arts, science or commerce degree and more than 300% for matriculation. This is not so much due to higher earnings as due to the fact that public cost still constitutes a small fraction of the total cost of education. Wherever it is not so as in engineering, medicine or agriculture the rate of net return on public cost is less than unity per unit of investment. Hence, a proper criterion for deciding investment in education would be net returns on total or direct cost or public cost alone because these alone reflect the real cost to the economy.

Policy Implication

Educational planning has to make decisions on the following strategies:

1. *Choice Between Science and Technology and Other Types of Education.* Capacity of enrolment for higher education in arts, commerce and professional education in law and education cannot be expanded as the differential net returns are negative on them. Simultaneously, capacity of enrolment for science and engineering may be expanded at a slower rate. In this context the criterion of returns has to be supplemented with manpower forecast and social demand approach.

2. *Choice Between Formal Education and ' On-the-Job-Training '.* The high rate of gross and net returns at matriculation level and low differential returns on higher education indicate the necessity of restricting higher education. Formal pre-employment education should make the people generally suitable for training while the imparting of special skill be the responsibility of employers. A more broad based education up to matriculation would make most of them suitable for all types of on-the-job-training. What is needed is a late specialisation, say, after 10 or 11 years of schooling as opposed to eight years at present. A reduction in number of years of formal education and short period of ' on-the-job ' training would not only reduce the cost of education but would increase their productivity and earnings simultaneously.

3. *The Choice Between the Levels of Education.* It is important in educational planning to make this choice due to limitation of resources and the low returns. The decision is difficult at the primary education level as the rate of return criterion is far outweighed in this field by social demand. The advantages of universal primary education cannot enter in cost and return calculation. But besides the social and constitutional aspect of primary education the planners have to realise the importance of ' functional literacy ' which plays a vital role in the modernization of under-developed countries in extending the effective communication at an extensive level.

A higher rate of return on high school education relative to education at higher level makes the choice clear in favour of restriction of higher education.

4. *The Choice Between Quality and Quantity.* The low earnings and productivity at higher level of education may be the result of low quality of education. The latter can be improved at the expense of quantity

which would not only avoid waste of education through reduction of unemployment but would also raise their productivity and earnings.

To sum up, the return criterion provides a very significant insight at the present stage for educational planning by showing the differential advantages at each level of education on all types of cost. But this by itself does not indicate the final policy measures. It has to be supplemented by other criteria as well.

TABLE 1

RATES OF RETURNS ON EDUCATION

Rate of Gross Return	*Matriculates*	*Graduates*			*Post-Graduates*			*Professional*					
		Arts	*Science*	*Commerce*	*Arts*	*Science*	*Commerce*	*Engineering*	*Medicine*	*Agriculture*	*Law*	*Education*	*Doctorate*
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Rate of Gross Return													
1. Public Cost	4·31	4·80	4·43	4·24	2·06	2·79	1·54	1·25	1·14	0·73	2·19	1·44	4·36
2. Private Cost	0·65	0·37	0·34	0·32	0·33	0·45	0·25	0·34	0·31	0·20	0·35	0·23	0·70
3. Direct Cost	0·56	0·34	0·32	0·30	0·28	0·39	0·21	0·27	0·24	0·15	0·30	0·20	0·60
4. Total Cost	0·56	0·16	0·16	0·14	0·11	0·16	0·09	0·14	0·14	0·09	0·12	0·08	0·16
Rate of Differential Gross Return													
1. Public Cost	...	4·26	3·72	3·31	1·28	2·26	0·63	1·03	0·90	0·47	1·44	0·50	4·15
2. Private Cost	...	0·22	0·20	0·11	0·29	0·41	0·14	0·29	0·25	0·13	0·23	0·07	0·68
3. Direct Cost	...	0·21	0·19	0·15	0·18	0·32	0·07	0·23	0·20	0·10	0·20	0·07	0·58
4. Total Cost	...	0·08	0·08	0·08	0·06	0·12	0·03	0·11	0·10	0·06	0·07	0·02	0·13
Rate of Net Return													
1. Public Cost	3·79	2·95	2·67	2·40	0·93	1·71	0·46	0·73	0·62	0·21	1·07	0·32	2·70
2. Private Cost	0·56	0·22	0·20	0·18	0·14	0·27	0·07	0·19	0·16	0·06	0·17	0·05	0·43
3. Direct Cost	0·49	0·21	0·19	0·17	0·13	0·24	0·06	0·16	0·13	0·05	0·15	0·04	0·37
4. Total Cost	0·49	0·10	0·09	0·08	0·05	0·10	0·03	0·09	0·07	0·02	0·06	0·02	0·10
Rate of Differentail Net Return													
1. Public Cost	...	0·46	0·35	0·72	0·13	0·94	0·72	0·47	0·35	0·07	0·04	0·89	2·07
2. Private Cost	...	0·02	0·01	0·03	0·03	0·17	0·16	0·13	0·10	0·01	0·006	0·15	0·33
3. Direct Cost	...	0·02	0·01	0·03	0·01	0·13	0·10	0·10	0·08	0·01	0·006	0·13	0·29
4. Total Cost	...	0·008	0·007	0·01	0·006	0·04	0·04	0·05	0·04	0·008	0·002	0·04	0·07

TABLE 2

COST AND EARNINGS BY LEVELS AND TYPE OF EDUCATION 1966

S. No.	Item	Matriculates	Graduates			Post Graduates		
			Arts	*Science*	*Commerce*	*Arts*	*Science*	*Commerce*
0	1	2	3	4	5	6	7	8
1.	Direct Public Cost[1]	357·00	678·00	745·80	673·00	1702·00	1971·20	1792·00
2.	Direct Private Cost[2]	2383·50	8790·00	9669·00	8790·00	11185·00	12303·50	11185·00
3.	Total Direct Cost[3]	2740·50	9468·00	10414·80	9463·00	12977·00	14274·00	12977·00
4.	Indirect Cost	...	10666·74	10666·74	10666·74	19771·36	19882·11	18866·86
5.	Total Cost	2740·50	20134·74	21081·54	20134·74	32748·36	34156·81	31843·86
6.	Annual Earning[4]	2446·50	4419·72	4473·48	3980·64	4016·16	7000·20	3859·32
7.	Annual Earning over that of Matriculates	...	1973·22	2026·98	1534·14	2469·60	4553·70	1412·82
8.	Annual Earning over that of Uneducated[5]	1855·50	3828·72	3828·48	3389·64	4325·16	6409·20	3268·32
9.	Yearly Leakages due to Unemployment[6]	318·05	574·56	581·55	517·48	639·10	910·03	501·71
10.	Gross Yearly Return (8-9)	1537·45	3254·16	3300·03	2872·16	3686·06	5499·17	2766·61
11.	Differential Yearly Gross Return (7-9)	...	1398·66	1445·43	1016·66	1830·56	3643·67	011·11
12.	Yearly Replacement Cost[7]	18·35	44·20	44·73	39·80	40·16	70·00	38·50
13.	Yearly Interest of Total Cost at 6%	164·43	1208·08	1264·89	1208·08	1964·90	2040·41	1910·63
14.	Obsolescence (not calculated)	...	...	...	...	...	...	...
15.	Total Deductions (12+13+14)	182·78	1252·28	1309·62	1247·88	2014·00	2119·41	1949·22
16.	Net Yearly Return (10-15)	1354·67	2001·88	1991·31	1624·28	1672·00	3370·76	817·39
17.	Differential Net Yearly Return (11-15)	...	146·38	135·81	—231·22	—183·50	1524·26	—1039·11

COST AND EARNINGS BY LEVELS AND TYPE OF EDUCATION 1966—(*Contd.*)

S. No.	*Item*	*Professional*					
		Engineering	*Medicine*	*Agriculture*	*Law*	*Education*	*Doctorate*
0	1	2	3	4	5	6	7
1.	Direct Public Cost[1]	6628·00	6628·00	6628·00	1792·00	1792·00	1792·00
2.	Direct Private Cost[2]	24437·60	24437·60	24437·60	11185·00	11185·00	11185·00
3.	Total Direct Cost[3]	31065·60	31065·60	31065·60	12977·00	12977·00	12977·00
4.	Indirect Cost	24624·00	24624·00	24624·00	19771·36	19771·39	35109·78
5.	Total Cost	55689·60	55689·60	55689·60	32748·36	32748·36	48086·78
6.	Annual Earning[4]	9133·80	8376·00	5570·64	5196·00	3636·00	8656·56
7.	Annual Earning over that of Matriculates	6687·30	5929·50	3124·14	2749·50	1189·50	6210·06
8.	Annual Earning over that of Uneducated[5]	8542·80	7785·00	4979·64	4605·00	3045·00	8065·56
9.	Yearly Leakages due to Unemployment[6]	274·01	251·28	167·12	675·48	472·68	259·70
10.	Gross Yearly Return (8-9)	8268·79	7533·72	4812·52	3929·52	2572·32	7805·56
11.	Differential Yearly Gross Return	6413·20	5678·22	2957·02	2074·02	716·82	5950·36
12.	Yearly Replacement Cost[7]	91·34	83·76	55·71	51·96	36·36	86·57
13.	Yearly Interest of Total Cost at 6%	3341·38	3341·38	3341·38	1964·90	1964·90	2885·21
14.	Obsolescence (net calculated)	...	...	...	...	...	...
15.	Total Deductions (12+13+14)	3432·72	3425·14	3397·09	2016·86	2001·26	2971·78
16.	Net Yearly Return (10-15)	4836·07	4108·58	1415·43	1912·66	571·06	4833·78
17.	Differential Net Yearly Return (11-15)	2980·57	2253·08	—440·07	57·16	—1284·44	2978·58

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[1] *Education in India* 1957-58—During the last ten years expenditure on public education has been doubied and simultaneously the students enrolment at each level has also increased almost to that extent. The per capita expenditure is, therefore, kept constant.

[2] It consists of expenditure on fees, books and additional expenses in education other than maintenance cost. A 10% increase in first and 100% increase in the last two items have been assumed since 1960-61. For details see my article 'Returns to Education: An Estimate,' *Education as Investment*, Singh B. (Ed.), Meerut, 1967.

[3] Indirect cost has been taken as equivalent to earnings foregone after matriculation at the average rate of annual earnings of the matriculates multiplied by the number of years required for further education plus the interest on earnings foregone at the market rate of 6 per cent upto the end of the period of further education. For post-graduates and professionals, earnings foregone have been taken at the average rate of earnings of the matriculates for the first four years and of the graduates for the remaining two years.

[4] Shrimali, P. D. *Patterns of Employment and Earnings Among Graduates in Lucknow* (*A Study based on Sample Survey*), Labour Research Centre, Department of Economic, Lucknow University, Lucknow, 1967, Table 25, pp. 105-106. It includes the earnings of all currently employed graduates who had completed their graduation by 1962. These are, therefore, synthetic earnings of cohorts of graduates of different years. The earnings of matriculates are taken from D.G.E.T. *Survey of Employment of Matriculates*. See my article quoted above. A 50% increase since 1960-61 has been assumed in their earnings corresponding to the extent of increase in the earnings of uneducated and graduates during this period.

[5] The earnings of uneducated are obtained by dividing the national income originating in each in each sector in 1966 by the workers in 1966. The latter are estimated on the basis of population projections made by the Registrar General assuming the occupational structure of 1961 Census which is assumed to have changed insignificantly during this period. It is further assumed that 90% of the workers with primary education or less are in agriculture, domestic services and rural industries and 10% in factories, urban small enterprises, commerce, transport and construction.

[6] See the text for details.

[7] Yearly replacement costs have been calculated on total cost at 0-75 for the matriculates having a working span of 40 years and 10% for others with a working span of 30 to 35 years assuming 6% compound rate of interest.

Chapter Twenty-Three

Productivity of Education with Special Reference to Under-Developed Countries

M. SINHA RAY

Those who think that the object of education is only to render assistance in becoming a competent and responsible man, develop power to understand and appreciate noble 'values,' moral and intellectual, and satisfy cultural wants may be accused of having a very limited view of the aim of education. In recent years it has been pointed out that in addition to the above mentioned aspects, education has another side—its productivity side which no one should ignore. It is recognized that education gives people some capacity as a result of which they can do their work in a much better way and such increased efficiency leads to an increase in income also. So, it is contended, now-a-days, that education which by imparting knowledge and skill increases efficiency and adds to productive capacity from the individual and national point of view, should be regarded as human capital.[1]

The view that acquired knowledge and skill is a kind of capital is not new. Adam Smith came across this issue and was of the opinion that 'the acquired and useful abilities of all the inhabitants or members of society' should be put in the category of fixed capital. He said, 'The acquisition of such talents, by the maintenance of the acquirer during his education, study or apprenticeship always costs a real expense, which is a capital fixed and realized, as it were in his person. Those talents as they make a part of his fortune, so do they likewise of that of the society to which he belongs. The improved dexterity of a workman may be considered in the same light as a machine or instrument of trade which facilitates and abridges labour and which, though it costs a certain expense repays that expense with a profit.'[2] Von Thunen is said to have had a similar view.[3] Fisher was in favour of a broader concept of capital where all these would be accommodated. But to think of human beings as wealth or capital was not considered to be consistent with the values held in an economic system where individuals are free and not slaves. J. S. Mill insisted that people of a country should not be considered wealth as wealth existed for the sake of people. Marshall realized the importance of education as a national investment and according to him, ' the most valuable of all capital is that invested in human beings.'[4] The following remarks from his *Principles of Economics* may be quoted here. Good education is ' an important means towards the product of material wealth ' (p. 176). ' It will be profitable as a mere investment to give the masses of the people much greater opportunities than they can generally avail themselves of ' (p. 179). Though he was ready to recognize human beings as capital from abstract and mathematical point of view, he rejected the idea as it would be out of touch with the market place to treat them as capital in practical analysis.[5]

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[1] T. W Schultz, 'Capital Formation by Education', *Journal of Political Economy*, University of Chicago Press, Illinois, December, 1960.

[2] A. Smith, *Wealth of Nations*, Modern Library, New York, 1937, pp. 265-66.

[3] Mentioned by T. W. Schultz—'Investment in Human Capital', *American Economic Review*, March, 1961, American Economic Association, U.S.A.

But it may be pointed out that we need not treat human beings as wealth or capital, what is required here is to treat certain elements in a human being's knowledge and skill as a kind of capital—non-physical human capital. Land is a factor of production and as a factor of production it has inherent fertility and productive capacity. But its fertility can be increased by applying capital. This increase in fertility does not come from the original and indestructible power of that unit of land—it is the result of the application of capital. Same may be the case with labour. As a human being a labourer has some efficiency and working capacity but that can be increased by means of education and training. Thus the acquired knowledge and skill which adds to the productive capacity of a man from the individual and social point of view is capital—human capital. It is a produced means of production not present in those labourers who have not gone through a course of education or training. Thus expenditure—investment in human resources is capable of bringing returns to the individual and to the community also.[6]

But we must not be blind to the fact that this human capital is different from non-human capital—plants and machines, etc. in the context of which the definition of capital as produced means of production is given. Human capital is intangible and has notional existence only.[7]

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[4] Quoted by F. Harbison and C. A. Myers, *Education, Manpower and Economic Growth*, McGarw Hill, New York, 1964, p. 3.

[5] T. W. Schultz, *American Economic Review*, March, 1961.

[6] Besides T. W. Schultz there are many others who support this view. Prof. W. G. Hoffmann in his paper 'Expenditure on Education and Research in the Process of Economic Growth' *German Economic Review*, Vol. 2, has supported this view. This journal is published from Stuttgart, W. Germany.

[7] V. N. Kothari's comment on papers on *Investment in Human Resources* read at Indian Economic Conference, 1965. These papers were published in the conference number of *Indian Economic Journal*, 1964 (Bombay).

It can be well conceived but it cannot exist independent of man; it works through human beings. As it is inseparable from human beings, it cannot be bought and sold in the market *i.e.*, it is not marketable. If it is judged in the light of the traditional definition of capital, it suffers from one deficiency that it is not transferable as it is not the external possession of man. Another characteristic of such human capital is that in some cases it serves both the purposes—consumption and investment but the fact that it may satisfy consumer needs also under certain circumstances does not constitute any special problem. Cases where education will only satisfy consumer preferences and will have no investment function are not numerous and can easily be ignored.

Again, as education and training is a variety of capital and not a separate factor of production its relationship with non-human capital is of a complementary nature. To handle successfully and effectively complex machines for increased production, labourers with superior skill are necessary and superior skill is the product of investment. Of course there is nothing uncommon in this relationship.

Now we consider in some details the productivity of education. But before passing on to it we should clarify the meaning of the term productivity which is a very knotty concept. Productivity is generally defined as the output obtained for resources expended—ratio of output to input in a particular time or place. Productivity may be the relation between total output and total input in a particular period—average productivity; or it may be the relation between increment in output resulting from the addition of one unit of a factor of production—marginal productivity. Productivity may be measured either in physical terms—physical units of output resulting from the use of a combination of factors or addition of a factor to the existing ones or value productivity measured in terms of money value of products produced. We know also that increased use of one factor keeping others constant leads to successive diminution of marginal products of the factor and gives rise to a law—the law of diminishing marginal productivity which comes into operation as elasticity of substitution among different factors is less than infinity. Even if it is easy to define and conceive in theoretical terms the average and marginal product or productivity of a factor, actual measurement and calculation is very difficult. In many cases factors and products are not homogeneous things; so in order to solve the basic problem of measuring changes in factor-product relations, a common measuring unit—denominator is to be found out; and it appears that there is only one way out—that is to measure diverse resources and output in terms of money. Marginal productivity analysis in real terms has the advantage of yielding more direct results about the factors' share in the national income but marginal productivity analysis in terms of money has the advantage of appearing more realistic and consistent with the thinking of individuals.[8] Even here all difficulties do not come to an end but we think that there is no need of enumerating all of them. It will be sufficient to refer to the case that terms like marginal product, productivity, marginal cost and marginal revenue which are liberally used in connection with the determination of the equilibrium position, etc. of a firm, are unknown to the firm accountants.

In the light of the above discussion it appears that measurement of productivity of education which is one variety of capital is more complicated. But it is also true that measurement of productivity of education and training may be difficult; economists may not agree on the method of calculation but it is not immeasurable. In the United States some economists have calculated returns from education from the individual point of view and its contribution to economic growth. Taking the costs of education (direct and indirect including earnings foregone at the time of undergoing a course of education and training, as investment G. S. Becker[9] estimated that average rate of return from investment in college education was 9% in both 1940 and 1950 for urban male whites, returns to non-whites, female and rural graduates being somewhat smaller. H. P. Miller[10] has shown how income is related to education—how attainment of more schooling increases life-time earnings. Some information given by him is quoted below.

TABLE 1

a. Life-time income based on arithmetic means for males in selected age groups by years of schooling completed.

Years of Schooling and Age	*Total Money Income*
Income from Age 18 to Death	
Elementary—Total	$ 154,114
Less than 8 Years	$ 129,764
8 Years	$ 181,695
High School	
1–3 Years	$ 211,193
4 Years	$ 257,557
College	
1–3 Years	$ 315,504
4 Years or more	$ 435,242

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[8] F. Machlup, ' On the Meaning Marginal Product ' *in Readings in the Theory of Income Distribution.* This book edited by W. Fillner and B. F. Haley was published by Allen and Unwin Co., London, 1950, on behalf of *American Economic Review.*

[9] G. S. Becker, 'Under-investment in College Education' *American Economic Review*, May, 1960.

[10] H. P. Miller, 'Income in Relation to Education' *American Economic Review*, December, 1960.

b. Income received from age 25-64 for males by level of school completed.

	Elementary High School Differential			*High School College Differential*		
Year	*Elementary School Graduate*	*High School Graduate*	*P. C. Differential*	*High School Graduate*	*College Graduate*	*P.C. Differential*
1	2	3	4	5	6	7
1946	$84,687	$114,023	35%	$114,023	$168,983	48%
1958	$149,687	$215,487	44%	$215,487	$366,990	70%

T. W. Schultz estimates from H. P. Miller's above calculations 11% rate of return from both high school and college education. In another place he estimates 35% rate of return from elementary education, 10% and 11% from high school and college education respectively. If some part of expenditure on education is considered consumption and deducted from it, rate of return will be higher. There are other persons who have also made such estimates but we think there is no need of discussing all of them.

Now let us turn our attention from the rate of return to individual over cost of investment to the contribution of education to national economic growth. In 1961 T. W. Schultz estimated that education accounted for 21–40% of national income growth in the U.S. over the same period. In 1962 Edward Denison published a study on factors contributing to growth of national income and he for the interval 1929–57 credited increased education per member of the employed labour force with 23% of the growth of national income.[11] There are also other persons[12] who have made such estimates, and percentage contributions of education to national income growth, according to them, are different. But instead of discussing all of them, let us consider Schultz and Denison's calculation in some details following the paper of M. J. Bowman.

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[11] *See* M. J. Bowman, Schultz and Denison, 'the Contribution of Education to National Income Growth', *Journal of Political Economy*, October, 1964.

[12] R. M. Solow, Hector Correa, etc.

TABLE 2

ESTIMATES OF THE PERCENTAGE INCOME ATTRIBUTED TO NATIONAL INCOME, 1929–57 OR 1929–56

S. No.	*Source*	*Contribution all Eds.*	*Contribution of Eds. in excess of 1929 values of per member of the labour force*	*Contribution of all Eds. associated with increase in employment*
0	1	2	3	4
1.	Denison	...	23	...
2.	Schultz (1)	21	17	4
3.	Schultz (2)	26	21	5
4.	Schultz (3)	40	33	8
5.	Revised values of row (4) without ability of adjustment	39	29	9
6.	Weights adopted from Hausen and applied to Schultz's stock carried figures	34	27	7
7.	Row (5) multiplied by 0·60 to match Denison's ability adjustment	23	17	5

Rates of contribution as shown above differ because of difference in approach or basis on which estimates have been made. Denison began with the resources that went into production during the above mentioned period and calculated the contribution of education. Schultz calculated on the basis of internal rates of return, the first estimate of Schultz is based on 9% rate of return, the second is based on 11% rate of return and the third is based on 35% from elementary school education and 10% and 11% from high school and college education respectively. If no adjustment is made for ability, values of row (4) come to what have been shown in row (5). Values will change if rates of return for women are considered to be lower.

From the above discussion it is revealed that there is no universally approved method of calculating rates of return from education either to the individual or to the community. Calculations which have been made are rough and guess work. Even if unanimity is reached on the principles of calculation, actual returns cannot be calculated in the same manner as in the case of a factory or a river basin development project. Even return from a particular educational project is not guaranteed to all individuals. It is more difficult to calculate rates of return from different kinds of education and training.

It must also be recognized that higher incomes of those with more years of schooling are due in part to difference in intelligence, home-environment, family connections and other factors and not due to education. H. P. Miller recognized this in his paper. Dr. V. K. R. V. Rao also points out' . . . . the return ascribable to human factor is not merely composed of technical skill that the human being has acquired as a result of education. Given the same conditions, given the same training, given the same facilities, we will find one group of persons making a certain contribution to production and another group of persons making a larger or smaller contribution to production. Many factors like environment, climate, tradition, discipline, motivation, etc. come into the picture.[13]

Besides these broad limitations, some other points have been raised and they deserve consideration. As the rate of return is related to costs of education, whatever reduces costs, raises the rate of return. Questions have been raised about the justifiability of the inclusion of foregone earnings in costs of education. But we do not find any reason to exclude them outright. When an individual makes a decision on undergoing some course of education or training, it is natural for him to calculate the loss and gain involved in the process and he will surely include earnings foregone in costs.[14] But it is admitted that calculation of such foregone earnings is difficult specially in some cases. Again, it is pointed out that when children go to schools, mothers are relieved of the duty of looking after them and can earn by doing some work and such earnings should be included in increased earnings from education. But it does not increase the earnings of the person educated though it may add to the earnings of the family at that time. This is not directly related to education, many other benefits in the form of external economies may follow from education but there is no reason why they should be taken into account in calculating the rate of return to the individual. If mothers have other children to look after, the question of earnings by mothers does not arise at all.

In addition to these, developing countries pose some special problems. It is difficult to calculate foregone earnings of students and also returns from education on account of the prevalence of a large degree of unemployment. There is no guarantee that all the students who are reading in colleges would have been employed if they had not continued further studies, nor is there any certainty that after the completion of their studies, they will be provided with employment. In developing countries there are problems of under-employment and disguised unemployment. Sometimes even small boys are found to do something which brings income; in other cases people remain unemployed or under-employed for long; in some other cases nature of work done has no relation with the qualification acquired and education received. Many students are admitted in colleges providing opportunities for general education (B.A. and M.A. Course); but as already many of them are unemployed, marginal productivity of many of them is zero from the community point of view.

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[13] V. K. R. V. Rao, *Education and Human Resource Development*, p. 67.

[14] *See* papers of M. V. Nadkarni and D. M. Nanjundappa in *Investment in Human Resources*.

The above discussion only points out that it is very difficult to calculate the exact rate of return from a particular kind of education and its contribution to national economic growth in terms of any exact percentage, which will get the approval of all. It does not mean that education is not productive in developed or undeveloped countries. The qualitative nature of the conclusion that generally education is sufficiently productive and its productivity may further increase if some measures are taken cannot be denied. From the study of H. P. Miller, H. S. Houthakker, V. K. R. V. Rao it is proved that there is positive correlation between earnings and education, degree of education and duration of education and training. The quotation given below is relevant.

' The results obtained for the U. S. economy do offer rather consistent (some might say surprisingly consistent) support for the notion that education, on the average has paid significant financial rewards . . . . The difficulties involved in indentifying earnings differentials with productivity differentials force one to be somewhat more cautious in drawing sweeping conclusions as to the effects of education on national output. However, here too the burden of proof is surely on those who would play down the economic importance of education.'[15]

There are reasons to believe that education may bring good returns in terms of increased earning and additions to the productive capacity of the nation in developing countries. Proper education will increase the supply of entrepreneurs, scarcity of which is a special problem. Expenditure on research, etc. will facilitate invention and new opportunities for investment and employment will be created and income level of people will be raised. Expenditure on suitable education will promote growth consciousness, remove superstition from the minds of people and bring about changes in institutions which will be favourable for economic development. Without the spread of education it is futile to expect to control the rate of growth of population by family planning which is an essential condition for economic development in developing countries. Though we can not exactly calculate the benefit in terms of a money rate, there is no doubt that it will pay to spend on education and training of selected type.

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[15] W. G. Bowen, quoted by Harbison and Myers in *Education, Manpower and Economic Growth*, p. 10.

Primary education whose main function is to remove illiteracy and provide with some knowledge is expected to be highly productive. Cost of such education is small and return is expected to be attractive in all walks of life. Gain to the society will be very large and such education is a must as no community can make progress without it. From the point of view of productivity, greater emphasis should be paid on technical and vocational education and on-the-job-training, science education rather than general education.

Whether education and training will be productive or not or how productive in a developing economy depends on the type of education and training imparted and whether some other measures are also being adopted in the economy or not. The Government in such a country should formulate an elaborate plan keeping in view the demand for educated and trained persons so that resources spent are not wasted. Meagre resources at the disposal of the community should be distributed over the creation of different types of educational facilities in the most efficient manner. In an underdeveloped society adequate stress should be laid on the development of agriculture which can be done without much difficulty and Government should plan for its educational facilities. Government should also spend an adequate amount on basic and applied research which will bring about development in agriculture as unlike industrial units, family farms are not in a position to finance, organize and conduct highly complicated and costly researches.[16] The returns from such expenditure will undoubtedly be very high. Professor Heady says, "we have ample evidence, then, that public investment in knowledge for agriculture and in knowledge of people in agriculture can bear high payoff, both in aid to general economic development and in value of resources to produce agricultural output at a demand level. The United States provides evidence in the Western world and Japan in the Eastern world . . . ."[17] Expenditure over scientific agriculture—water management, application of fertilisers, insecticides, new varieties of seeds, multiplication of cropping pattern, etc. is expected to give good returns from the national point of view.

Value of education to a great extent depends upon the subject of education that is taught. If the curriculum is below the normal standard and with little relation to reality or practical necessity, it may be less productive or unproductive. Another thing is to be kept in mind. There is a complementary relationship between human capital and non-human capital, so, for one to become adequately productive the help of the other is absolutely necessary. They must grow at a certain rate and the optimum relationship[18] is to be found out. If the rate of growth of one is too fast and that of the other too slow, maximum economic growth will not take place. Foreign leaders should also take note of this fact that if only machines are supplied but no technical know-how, productive capacity of underdeveloped countries will not increase.

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[16] T. W. Schultz, *The Economic Organization of Agriculture*, p. 111.

[17] Earl, O. Heady, *Agricultural Policy under Economic Development*, Iowa State University Press, Iowa, U.S.A., p. 602.

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[18] W. G. Hoffmann in " Expenditure on Education and Research in the Process of Economic Growth "—(II) *German Economic Review*, Vol. 2, No. 3, has discussed this issue.

Section IV

Productivity of Education and Policy Issues

The contributions in this section generally deal with the problems of productivity of education and policy issues.

V. R. Panchamukhi and P. R. Panchamukhi in their joint paper *Socio-Economic Variables and Urban Income* investigate the roles of 49 variables on the earnings behaviour of an individual. The authors emphasize that earning are a function of many socio-economic variables and education is only one of the variables. Therefore, they strongly feel that it is incorrect to attribute total income differentials to the educational differentials of an individual.

D. P. Chaudhari in his paper *Education of Farmers and Productivity* examines two important hypotheses: (*a*) the levels of agricultural productivity is significantly related to the level of education of cultivators and (*b*) a pattern of agricultural inputs is significantly related to the level of education of cultivators. The results of his analysis are of a considerable relevance for planning of education in India.

M. L. Patel in his paper *Rationale of Human Capital and Its Productivity Analysis* points out that the developing countries are importing capital equipment from the developed ones and are also trying to create needed human capital. In his opinion even human capital for the time being may be imported because of long time lead involved in its production. He also attempts a comparison of productivity of human capital between different countries and finds the gaps are widening. Differences in his opinion are due to the flow of human capital from under-developed countries to developed countries.

B. Ramamurthy and M. S. Prakasa Rao in their paper *Terminalization Approach to Pre-University Education* strongly feel that if the labour force in the age group 5 to 17 in the traditional sector of Indian economy is provided with general education upto middle and secondary level followed by vocational training in the net work of multipurpose-cum-workshops and if people who are skilled are absorbed in the traditional occupations with modern tools and techniques, two effects may be expected: (*a*) the problem of matriculate unemployment will be solved and (*b*) poor workers' income in the vast traditional sector will be significantly increased.

D. A. Dabholkar in his paper *Investment Strategies for Crucial Sectors in Indian Educational System* raises certain important points relating to shift in emphasis from quantity to quality of education and this, he believes, can be achieved if recruitments in the public services are made on the basis of efficiency rather than on the basis of qualifications of the persons. He suggests certain measures by which standard of education can be maintained and investment in education can be economized at the same time.

P. C. Malhotra in his paper *The Economics of Correspondence Courses for Higher Education* highlights the following main points: (*a*) educational expenditure should not be considered in isolation but in conjunction with other fields of housing, health and social services which also improve quality of human capital, and (*b*) any educational plan or programme worth the name has got to be related to manpower requirement of the economy. There is a need for internal consistency in the expansion of different levels and sectors of education and wastage of all types may be avoided. He also points out that expenditure on correspondence courses for degree classes is found to be very small in comparison to regular courses.

P. D. Hajela in his paper *Investment in Education—A Point of View* mentions that education is an investment good. But he points out that it does not follow that more and more investment in education would benefit the economy. In this connection he cites the example of excess supply of educated persons during the plan periods in India. Further, he believes that change in the direction of students from general to vocational and technical courses would not provide a solution to the problem because there exists no shortage of technical and professional skills in the country. Since over-investment in education will result in a glut in the employment market and a fall in the premium on education there is a danger that the quality of knowledge will be lowered. Finally, his analysis reveals that solution to the problem lies in investing more and more in research on problems relating to increase in the pace of economic development and decrease in the unit cost of education.

Chapter Twenty-Four

Socio-Economic Variables and Urban Incomes

V. R. PANCHAMUKHI and P. R. PANCHAMUKHI*

Introduction

For any systematic analysis of the problem of income-distribution, it is necessary to study not only the nature of the distribution, but also the factors that determine this nature. While there have been a few studies on the nature of the distribution, the studies on the determinants of distribution are very scarce. Conventionally, the only major factor considered to explain the income differentials, is the ability to earn.[1] If each individual is paid what he is worth, then the individual earnings would be distributed normally, since the abilities which determine the earnings, are also normally distributed. Though this approach might be theoretically significant no empirical verification and statistical testing can be carried out along this line. Since in reality, income distributions are generally skewed, attempts have been made to explain this asymmetrical feature, by the variables like inherited property (Pigou), skill differentials (Becker), extent of unionisation etc. The other observable factors, which determine earnings and which are generally not explicitly considered, however, are, the socio-economic variables like age, sex, occupational class, educational level, health level, religion, region etc. Though no testable theory of income-distribution has been worked out as yet, the recognition of these socio-economic factors in some empirical studies, is itself a significant advance towards that direction.[2] It would be of great interest to assess the relative importance of the socio-economic factors as against the other factors as the determinants of individual earning levels and their relative impacts on the pattern of income-distribution. The purpose of this paper is to make a quantitative appraisal of the various socio-economic variables in case of the income-differentials in some selected urban centres of the Indian economy. The paper begins with the description of the sources of the data used in this study. Then it goes on to describe the methods

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of quantification for the association between the socio-economic factors, and for the study of the nature of the income distribution in each socio-economic class. It develops a method for separating from the total concentration ratio of income-distribution, the contributions made by the different socio-economic factors, and describes how this decomposition into the different contributions can be used for educational planning so as to reduce the inequality of the socio-economic income-distribution. And finally we present and discuss the results based on the data for some selected urban centres. The analysis of the contribution of the socio-economic factors to the earning levels and the earning-distribution has been, however, confined to the data for Bombay city only. The paper does not consider at any stage the dynamic aspects of income-distribution.

The Data

The data of the individual earnings for the country as a whole, with detailed socio-economic classifications, though desirable, are not available for India. The total income-distribution pattern can be derived in a limited way, from the data of income-tax statistics, and the income-distribution in relation to only some of the socio-economic characteristics, is available in the reports of the NSS. The present study is, however, restricted to a few selected urban centres, and the required data for these centres are generally available in the various reports of the city-surveys conducted by different institutions, on behalf of the Research Programmes Committee of the Planning Commission. Since the RPC initiated and financed a series of Socio-Economic Surveys in 1954, there have been about 21 such surveys. But we could extract the required information for our purpose, from the reports of fourteen centres,[3] including the major ones like Bombay, Calcutta, Hubli, Hyderabad and Poona. In using the data from diverse sources, one has to be extremely cautious. The different surveys use different methods for collecting data, define their own concepts, and present the results in different ways. It was highly desirable that the RPC had prescribed a uniform pattern for concepts and presentation of data, for all city-surveys. The breakdown of earners by earnings and industry, education, and occupation are not available in all surveys. While some surveys (especially Bombay Survey) give both the frequencies and average earnings for different cross classifications, others present the tables only in percentage frequency forms. The concept of earners is also not uniform. In the Calcutta Survey, any body who receives some money income, however small, has been defined as an earner, while in the Durg and Raipur Survey, a person was considered an earner, if his income was sufficient to maintain himself.

Domestic servants are included in the earner class in some surveys while in others they are not included. It is not certain whether the Calcutta Survey includes domestic servants or not. In the Poona Survey earners include pensioners and those who are currently engaged in any activity yielding some income. It is not possible, nor relevant here, to list all the anomalies and the limitations, in the methodology and the concepts adopted in the different surveys. Wherever possible we have brought in a certain amount of uniformity. However, we hope that notwithstanding these differences, the results are broadly comparable and useful.

From the comparison of the different reports, we found that the reports of Bombay and Hyderabad surveys provide very comprehensive and detailed tables of cross-classifications, which could be useful for quite a wide range of research workers. Since we could have ready and quick access to the original schedules and other particulars for the Bombay Survey, we decided to proceed in further details only in case of Bombay and cull out the information that is required for a comprehensive analysis of our problem. In the published report of the Bombay Survey, all the tables show the total number of earners to be 19,301. In the Introductory Chapter, it is stated (p. 5) that the earners belonging to the additional households, were not included in the tables of the book. These earners, belong to the categories of domestic servants, (about half of the total of these excluded earners) cooks, paying guests, sub-tenants etc. While some information on the domestic servants is presented in the book, these additional earners were not included in the analysis perhaps for conceptual or comparability reasons. We decided to include that data on these earners for our purpose. After scrutinizing the original schedules for consistency and completion of data, we got the information from *all* the schedules of the survey, repunched and retabulated in a form suitable for our analysis. The total number of earners now is 22,859. The new frequency tables (1-way, 2-way and 3-way for different socio-economic characteristics) were derived from these data. The proportional frequency structures, and the 99% confidence intervals for the proportional frequencies, were calculated for the different industrial categories, occupational categories, and for education, sex, employment status and age categories. The average earning levels for these categories were also estimated.[4]

The detailed analysis of income-distribution by different socio-economic characteristics, contributions of socio-economic factors to earning capacity of the individuals, and to the inequality of income-distribution in the economy, is confined to the Bombay city only and is based on the new frequency tabulations derived by us. The descriptions of the industry, occupation, education, age classifications, used in the following pages, is presented in the Appendix at the end of the paper.

Methods of Quantification

In the analysis presented in the following pages, the problem of measurement is tackled in three broad areas. Firstly, the problem of measuring the strength of the association between the earning of an individual and any socio-economic characteristic taken separately, and also the extent of the association between pairs of the socio-economic factors. Secondly, the problem of identifying the nature of the distribution of the earnings within each socio-economic class is considered. The third area of measurement is the problem of separating from the total earning level and the total inequality in the distribution of earnings, the contributions made by the different socio-economic characteristics. We shall describe below the statistical methods adopted for the purpose of quantification, in each of these cases.

Measures of Association

The socio-economic factors cannot be in general, quantified in absolute terms. The characteristics like religion, sex, occupational class, or employment status, are rather non-measurable attributes than quantitative variables. (Since, the valuation of the different categories of each factor is not possible, arbitrary scoring of these categories to reduce them to some cardinal scale, or ranking them in ordinal terms, is replete with conceptual difficulties.) These factors must be treated as non-measurable attributes only and scoring method or ranking method must be adopted only when it is absolutely necessary. There are many methods suggested in the literature[5] for the purpose of measuring the association between attributes or between attributes and variables etc. While Yule's coefficient of association [given by

$$Q = \frac{n_{11}\, n_{22} - n_{12}\, n_{21}}{n_{11}\, n_{22} + n_{12}\, n_{21}} \quad \text{or}$$

its modification $Y = \dfrac{\sqrt{n_{11}\, n_{22}} - \sqrt{n_{12}\, n_{21}}}{\sqrt{n_{11}\, n_{22}} + \sqrt{n_{12}\, n_{21}}}$] is relevant for the frequency tables of the 2 × 2 type, the Karl Pearson's x^2 coefficient, and the coefficient of contingency given by $C = \dfrac{x^2/n}{1 + x^2/n}$ or Tsohuprow's modification $T = \sqrt{(x^2/\lambda)/(m-1)\,(n-1)}$ or Cramer's formula $R = \dfrac{x^2/n}{Min\ (m-1),\ (n-1)}$ are useful for any general $m \times n$ frequency table of two attributes. These formulae measure the association in the sense of departure from statistical independence. These measures do not possess any meaningful direct interpretation. They are derived as some arbitrary functions of x^2, so that they lie between

0 and 1, the extreme values corresponding to independence and ' complete association ' for the attributes. In the following pages, however, we shall adopt some different measures which provide for an operational interpretation most suited to the socio-economic factors. The association between A and B is based on the ' predictability ' of one from the other.[6] In general, this predictive-association between any two attributes A and B, can be considered in the following different cases:

Case (1). Suppose that the ordering of the A categories and that of the B categories is not of interest or is not possible. An individual is chosen at random from the population and we are asked to guess his B class as well as we can, either (*a*) Given no further information, or (*b*) Given his A class.

One can do no worse in case (*b*) than in case (*a*). The measure of association (when prediction of B from A is considered) is defined as follows:

$$\lambda b = \frac{\left\{\begin{matrix}\text{Probability of error of prediction}\\ \text{in case } (a)\end{matrix}\right\} - \left\{\begin{matrix}\text{Probability of error}\\ \text{in case } (b)\end{matrix}\right\}}{(\text{Probability of error in case } (a))}$$

Thus λ*b* gives the relative decrease in the probability of error in guessing B class as between the A class unknown and A class known. To put this another way, λ*b* gives the proportion of errors that can be eliminated by taking account of knowledge of the A classification of the individual; λ*b* lies between 0 and 1; it assumes the value of 0 if and only if the knowledge of A classification is of no help in predicting the B classification, and it assumes the value of 1, if and only if the knowledge of A completely specified the B class. Further λ*b* is unchanged by permutation of rows or columns. If A and B are statistically independent λ*b* is zero while the converse is not true. Since the association is defined in a way different from the concept of departure from statistical independence, this last property may not be regarded as a disadvantage of the measure. If one considers the prediction of A class, a coefficient λ*a* defined as the relative decrease in the probability of error in guessing A class as between B class unknown and B class known, gives the measure of the association. If such asymmetry in the prediction *i.e.*, of A from B, or of B from A, is not necessary or not relevant, the measure of association must be based on the ' predictability ' of B from A half the time at random and ' predictability ' of A from B half the time. Such a measure may be denoted by λ. The value of λ lies between λ*a* and λ*b* and has the same properties as λ*a* and λ*b*. While λ*a* and λ*b* are called as measures of association based on asymmetrical optimal prediction, λ is called as the measure of association based on symmetrical optimal prediction.

Case (2). In some cases the order of the classifications is of interest. For instance, we want to know the association between education and earning levels, we should have a measure which can indicate whether higher education implies higher earning capacity, or not. Suppose the categories of education factor are arranged in some *increasing* order, and the earning groups are also ordered in an increasing order. Suppose two individuals are selected at random, from the population. One would then ask the following question: Are the individuals in the same ordering, both with respect to education and earning levels? If there is a strong association between education and earning one would expect the ordering to be the same, and if there is strong counter-association, the order in one should be reversed in the other characteristic. For measuring such association, we have derived the conditional probability of like ordering (conditional on the absence of ties) and conditional probability of unlike ordering, and the difference between these two probabilities, is defined as the measure of association based on optimal prediction of order. This difference gives how much more probable it is to get like than unlike orders in the two attributes when the two individuals are chosen at random from the population. This measure r lies in the range of —1 and +1, the extreme values being assumed in the extreme situations viz. the two attributes do maintain an exactly reverse order and if they maintain like order.

These measures λb, λa, λ and the two conditional probabilities πs and πd, and the measure of association r, are derived for different pairs of socio-economic factors, and for the different urban centres. The formula for deriving these from a two-way frequency table (n_{ij}) for two attributes A shown in rows and B shown in columns, are the following:

$$\lambda b = \frac{\sum_i n_{im} - n_{\cdot m}}{n - n_m}$$

$$\lambda a = \frac{\sum_j n_{mj} - n_{m\cdot}}{n - n_{m\cdot}}$$

$$\lambda = \frac{\sum_i n_{im} + \sum_j n_{mj} - n_{\cdot m} - n_{m\cdot}}{2n - (n_m + n_{m\cdot})}$$

$$\pi s = 2\sum_2 \sum_j nij \left\{ \sum_{i>} \; \sum_{2j>b} n^{ij} \right\}$$

$$\pi t = \sum_i n_i^2 + \sum_j n_j^2 + \sum_i \sum_j n_{ij}^2$$

and $$\surd = \frac{2\pi s + \pi t - 1}{1 - \pi t}$$

where n_{im} = Maximum in the i^{th} row

n_{mj} = Maximum in the j^{th} column and $n_{\cdot\mathrm{m}}$ and $n_{\mathrm{m}\cdot}$ are the maxima in the column and row totals respectively. The standard errors, and the tests for the significance of these estimators, are given by more complicated expressions, they are not presented here. Detailed discussion may be obtained in the series of articles by Leo A. Goodman and William H. Kruskal.

Measures for the Distribution of Earnings

To study the nature of the distribution of the earnings, in the total earners class, and also in the earners groups classified by different factors like education, occupation, age etc. we adopt the usual measures, viz. the coefficient of concentration, coefficients of skewness and kurtosis. The coefficient of skewness is given by $\beta_1 = \frac{m_3}{m_2^{3/2}}$ and the coefficient of kurtosis is given by $\beta_2 = \frac{m_4}{m_2^{2}}$, where m_2, m_3, and m_4, are respectively, the second, third and fourth central moments in the sample. The values of β_1 and β_2 derived from the sample are good estimates of the true parameter values of β_1 and β_2. Wherever the sample size is very large, tests for significance can be carried out. The coefficient of skewness indicates in general terms, whether the earners are relatively more spread out in the large income groups or in the low income groups or are symmetrically distributed. The degree of concentration *i.e.*, the extent of inequality in the over-all distribution of earnings is indicated by the coefficient of concentration. The coefficient of kurtosis indicates the extent of the peakedness *i.e.*, whether the numbers of earners in the adjacent earning classes differ by very wide margins so that the frequency curve is more steeply rising upto the modal value and then falling, and has a large peak, or whether the numbers of earners in the adjacent earning classes change in a slow movement, so that the frequency curve is more flat. If a frequency curve is too sharply peaked, it implies that each earning class out-numbers its following or preceding earning class by a very sharp margin; in such a society, the earners are likely to be more conscious of their earning class, by virtue of the sharp majority or minority in relation to the other adjacent earning class. If a curve has large skewness to the right, this implies that there are a few earners with large earnings, who constitute conspicuously distinct groups from the rest of the society. The formula for the coefficient of concentration is $R = {}_{\mathrm{i}}\Sigma = 1\ (P_{\mathrm{i}}Q_{\mathrm{i}} + 1 - P_{\mathrm{i}} + 1Q_{\mathrm{i}})$ where P_{i} = Proportional cumulative frequency for *i*-th income and Q_{i} = Proportional cumulative earnings up to the *i*-th income class inclusive. These properties of the different measures will be used in interpreting the results in the subsequent pages.

Marginal Contributions of the Socio-economic Factors to the Earning Capacity

Total earning of an individual is the net result of his socio-economic characteristics and the residual factors. To separate the contribution of each socio-economic factor, and that of the residual factor, we postulate the following linear model under multiple regression hypothesis:[7]

$$Y = \mu + b_1E_1 + b_2E_2 + \ldots\ldots + b_{10}E_{10} + c_1C_1 + c_2C_2 + \ldots\ldots + c_9C_9 + \ldots\ldots +$$

where Y = Earning level of an individual.
μ = Over all general effect on the earnings, which is constant for all the factors.

and E_1, E_2 . . . . are dummy variables for the different socio-economic classes defined as below:

E_1 = 1, if the individual belongs to the 1st education class,
= 0 otherwise
E_2 = 1, if the individual belongs to the 2nd education class
= 0 otherwise

etc.

$E_1\ E_2 \ldots\ldots E_{10}$ = Dummy variables for the education factor.
$e_1, e_2 \ldots\ldots e_{10}$ = Respective coefficients.
$D_1, D_2 \ldots\ldots D_9$ = Dummy variables for the industry factor.
$d_1, d_2 \ldots\ldots d_9$ = Respective coefficients.
$C_1, C_2 \ldots\ldots C_9$ = Dummy variables for the occupation factor.
$c_1, c_2 \ldots\ldots c_9$ = Respective regression coefficients.
$A_1, A_2 \ldots\ldots A_6$ = Dummy variables for the age classification.
$a_1, a_2 \ldots\ldots a_6$ = Respective coefficients.
$I_1, I_2 \ldots\ldots I_8$ = Dummy variables for the family income group to which the earner belongs.
$i_1, i_2 \ldots\ldots i_8$ = Respective coefficients.
$M_1, M_2 \ldots\ldots M_3$ = Dummy variables for the employment status.
$m_1, m_2 \ldots\ldots m_3$ = Respective coefficients.
and S_1, S_2 = Dummy variables for the sex factor.
s_1, s_2 = Respective coefficients.

In the above model there is no interaction-effect considered, which implies that the effects of the different factors are additive in nature. The coefficients, $b_1 \ldots\ldots b_{10}$, $c_1 \ldots\ldots c_9$, etc. give the contributions made to the earning level by the different socio-economic classes. The regression coefficients must be estimated by the method of least squares. The usual assumptions for the error-term (the assumption of normal-distribution is not required for the purpose of estimation), are: viz. $E(\epsilon_i) = 0$ $E(\epsilon_i\,\epsilon_j) = 0$ for all $i \neq 6^{r}_{t} = j^2$ for all $i = j$. Then the least squares method gives best linear unbiased estimators. But with the above model with dummy variables, the matrix of the coefficients of the normal equations becomes singular. We therefore reparametrise the model by defining the following new parameters:

$$b'_i = b_i - \bar{b}$$
$$c'_i = c_i - \bar{c} \text{ etc,}$$

where $\bar{b}$ = the weighed average of the effects of all educational classes, the weights being the proportional frequencies in the respective classes. $\bar{b}$ may be called as the average effect of education.

$\bar{c}$ = the weighed average of the effects of all occupational classes, the weights being the proportional frequencies in the respective classes. $\bar{c}$ may be interpreted as the average effect of the occupation factor.

Similarly, $\bar{d}$, $\bar{a}$, ... $\bar{s}$, are defined. b'_i now gives the contribution of the i-th education class, as a deviation from the average effect of education. Similarly, $^{c}j'^{1}$ gives the contribution of the j-th occupation class as a deviation from the average occupation effect. The model is now

$$Y = \mu' + b'_1 E_1 + b'_2 E_2 + \dots + b'_{10} E_{10} + c'_1 C_1 + \dots c'_9 C'_9 + \dots + \varepsilon .$$

and the additional restrictions on the estimation procedure are:

$$\Sigma\, w_i\, b'_i = 0, \quad \Sigma\, k_i\, c'_i = 0, \text{ etc.,}$$

where w_i, k_i, etc. give the proportional frequency weights used in constructing the average effect. By appropriately augmenting the matrix of the coefficients of the normal equations, so that it becomes symmetric and is non-singular. We can derive the unique solutions for the new parameters.

To test the assumption of the additivity of effects, one can add the interaction terms in the above model. For instance, if the interactions between age and education need to be considered, we have to introduce $10 \times 6 = 60$ more dummy variables for each cross-classified cell of age and education. These dummy variables are $E_1 A_1$, $E_1 A_2$, ... $E_1 A_6$, $E_2 A_1$, $E_2 A_2$, $E_2 A_3$ . . . . $E_{10} A_1$, ... $E_{10} A_6$.

One may not always consider all interaction—components. To keep the model manageable even with interaction terms, one may choose only a few relevant interaction terms for introducing in the model.

After deriving the estimates of the coefficients, one can derive the total contribution of all the socio-economic factors, and the contribution of the residual factors. The tests of the significance for the socio-economic coefficients (including the interaction terms), can be performed, if the residual earnings are normally distributed. Before applying the tests for the coefficients, we would therefore test whether the residual earnings are normally distributed or not. It may be noted that since the sample size is very large, the large-sample tests for normality can be applied.

We have also postulated a semi-log model as follows:

$$\log Y = \mu + b_1E_1 + \dots . b_{10}E_{19} + \dots . +$$

Similar reparametrisation and the estimation procedure as above will be applied in this case also.

Contributions of the Socio-Economic Factors to the Inequality in Income Distribution

Just as the earning-capacity of an individual is influenced by his socio-economic characteristics and the residual factors, the nature of the distribution of earnings in the society as a whole is influenced by the structure of the population according to the different socio-economic groups, (*i.e.* the proportions of the population in the different educational groups, occupational classes, and in different cross-classifications say by education and occupation, etc.) and the earning capacities of the socio-economic factors, and the residual factors. It would be interesting to isolate from the total inequality in the distributions of earnings, the contribution made by each of the socio-economic factors, and that made by the residual factors. For this purpose, we have developed a new method which splits the total coefficient of concentration for the socio-economic-earnings, *i.e.*, the earnings induced by the socio-economic factors only so that the total earnings = (socio-economic-earning) + (residual earning), into the different components due to the different socio-economic classes.

Suppose, that by the method explained above, the socio-economic-earnings of each individual are estimated and the entire sample is reclassified by the socio-economic-earning groups and the factors, education, occupation, industry, etc. Let

P'_i = proportion of the total in the *i*-th socio-economic-earning class.
i = 1, 2, ... 8.
P'_{ik} = Proportion of the total, belonging to the *i*-th socio-economic-earning group and the *k*-th socio-economic-class.

P_i and P_{ik} without prime give the corresponding estimated proportions. Now, K is defined to take values from $k = 9$, to 56. $k = 9$, to 18, stands for education factor, $k = + 9$ to 27 gives the occupation classes, etc. The socio-economic-earning of an individual is given by

$$Y^s = \pounds + \beta_1E_1 + \quad + \beta_{10}E_{10} + \dots . + \beta_{55}S_{51} + \beta_{56}S_2.$$

We have used the notation $\beta 9 \dots . \beta 56$ to denote the contributions of the socio-economic factors to the earning capacity.

Total *S-E* earning of the first earning-class is obtained by summing the Y^s of all the individuals who belong to the first earning class.

$$Q'_1 = n \left[\pounds P'_1 \sum_{+k=9}^{56} P'_{ik}\beta_k \right]$$

Similarly, the total earning in the 2nd *S-E* earning class is given by

$$Q'_2 = n \left[\pounds P'_2 + \sum_{k=9}^{56} P'_{2k}\beta_k \right]$$

The total cumulative earning of the 2nd class is therefore,

$$Q_2 = \left[\pounds P'_2 + \sum_{k=9}^{56} P'_{2k}\beta_k \right] n$$

Where P_2 and P_{2k} without prime indicate the cumulative proportional frequencies. By constructing the table of cumulative frequencies, and the cumulative earnings for the eight *S-E* earning classes, we derive the coefficient of concentration R^s as given below.

$$R^s = \frac{\sum_k \left[\sum_{i=1}^{7} (P_i P(_{i+1})_k - P_{i+1} P_{ik}) \right] \beta_k}{A}$$

From the above expression for the coefficient of concentration for the Socio-Economic earnings, we find that the contribution made by the *K*-th *S-E* class is

$$\left[\frac{\sum_{i=1}^{7} (P_i P(_{i+1})_k - P_{i+1} P_{ik}) \beta_k}{A} \right]$$

It is now possible to compare the relative role of the different socio-economic factors for their impact on the income-distribution in the economy. If R is the coefficient of concentration for the total earnings, and R^e that for the residual earnings, comparison of R^s, and R^e with R gives the relative role of *S-E* factors and the residual factors in respect of distribution of earnings. It may be noted that R^s, R^e, are not additive to give the total concentration coefficient R. There could be some interaction between these factors in giving the final distribution pattern.

Simulation for Optimum Manpower-Planning

The expression derived for R^s above, has very interesting usefulness in manpower planning. In so far as the residual factors are not controlled by the planner, the manpower planning implies only manipulating the structure socio-economic classes in the population in a suitable manner. The basic question in manpower-planning is therefore one of finding the distribution of the total earners in the different *S-E* classes, so that the objectives of planning are realized. Suppose, the objective is one of reducing the inequality of income-distribution indicated by R^s, to the minimum level. Assuming that the marginal *S-E* contributions to earning capacity (*i.e.* the β'^{s}), remain constant, we can try different sets of values for P_i, and P_{ik}, $i = 1, \ldots . 8$, and $k = 9, \ldots . 56$, and obtain R^s in each set of values. Each set of values for P_i and P_{ik} gives one plan for the manpower structure. P_i and P_{ik} must be simulated under the following conditions:

$$P_i = \sum_{k=9} P_{ik}$$

$$= \sum_{k=19}^{27} P_{ik} = \sum_{k=28}^{36} P_{ik} = \sum_{37}^{45} P_{ik} = \ldots . = \sum_{55}^{56} P_{ik}$$

for every *i*.

Some of the plans may not be feasible from the point of view of practical implementation. Thus, we may consider only feasible plans and the one feasible plan which gives the smallest value for R^s, may be prescribed as the optimum plan for the *S-E* structure of the earners.

Of course, the problem of deriving an optimum plan can be better solved by constructing a programming model, with objective function R^s to be minimized. But the technique of simulation will be used only to indicate the role of *S-E* structure in the reduction of the inequality of income-distribution.

Results and Discussion

Measures of Association. The coefficients of association of the type indicated in the previous section are worked out between earnings and the socio-economic factors, and between pairs of socio-economic factors for a few selected urban centres and the results are presented in Table 1.

Industry and Earning Levels. The classifications of the industries, occupations, etc. and the earning groups used for the frequency tables, are given in the Appendix Notes. The coefficients of the association between industry and earning levels are generally all very small. This indicates that there does not exist any strong association between industry and earning level. The values of λb are all higher than λa and the values of λ are distinctly high for Bombay, Durg, Hubli and Raipur. From the examination of the frequency tables for earners by earning groups and industrial classes for these cities, we find that the earners in each earning class, are generally concentrated to a large extent in one industry (different for different earning classes) and are thinly spread out among the other industries. (n_{im} are large for every i). For this reason the values of λb and hence those of λ are large for these cities. The value of λ could be higher if the proportion of persons absorbed in the modal industry (*i.e.* the one with the largest number of earners) does not differ too much from the proportion of earners in all the other industries. This implies a diversified industrial structure in which different industrial complexes are well developed to absorb large number of earners. As the degree of diversification in the industrial structure becomes smaller and smaller the values of λb and hence of λi become smaller, λa could be large if there is a fairly diversified structure of the earners among the earning classes. In Bombay, the modal earning class (*i.e.* the one with the highest number of earners) does not differ much in regard to frequency, from the other earning classes. For this reason λa is also large for Bombay.

Larger values of λa indicate either that

a. there is greater diversification in the industrial structure; or

b. there is a greater diversification in the structure of earning classes; or

c. earners in each earning class cluster in one industry (different for each earning class); or

d. earners in each industry cluster in one earning class (different for each industry); or

e. all the cases (*a*), (*b*), (*c*) and (*d*) together or in any other combination.

The varying values for the different cities can be used to reflect the industry earning association as described above. The values in the following cases of pairs of factors may be interpreted on similar lines.

Occupation and Earning Levels. The coefficients of association between occupation and earning levels are also generally very small indicating weak association between these two factors. These are relatively high for the cities of Delhi, Jamshedpur, Bombay and Baroda. It is not true that for those cities for which the association between industry and earning was high, the association between occupation and earning also should be high. For Hubli, the former association is high ('0846) while the latter is very weak (0'0115). The occupation structure is not well-diversified. A single occupation viz., subordinate technical occupation, absorbs about 60% of the earners. Again within each occupation class, the earners are not clustered in some definite earning class; they are uniformly spread out in different earning groups. The earners in each occupation class are likely to cluster in some earning class, if there are strong trade union activities, and the earners in any particular occupation are conscious of the income-differentials when compared with their fellow-earners, in the same occupation. The Hubli city with 'its lop-sided picture of the occupational distribution of the earners' (Survey Report) does not possess any of these features and therefore the degree of association is small. Both *b* and *a* are relatively large for Delhi and Jamshedpur. Even though the trade union activities are supposedly strong in Bombay, the occupations are not identified by definitely specified earning class, because the occupations are carried on at very small and also at very large gradations. In Delhi, the different occupations are generally identified with definite earning classes.

Education and Earning Levels. In view of the data limitations, the association between education and earning levels could be worked out only for two cities viz. Bombay and Hyderabad. The coefficients are moderately high. For examining the strength of the association, when ordering in education and in earning are considered, we computed the measures based on optimal prediction of order. The conditional probability of like ordering is quite high implying that when two individuals are chosen at random and higher the educational level of one as compared with the other, the earning levels are very likely to be in the same order. The coefficients of association based on order (λ's) are quite high for both the cities. This substantiates the hypothesis that education contributes to the earnings of an individual. The coefficients of association are higher for Hyderabad than for Bombay. This may be due to the fact that in a highly advanced city like Bombay where opportunities for many enterprises and business are plenty, people having certain education level, do not cluster in a specific earning group. In Bombay, even matriculates are in high earning groups. In a city like Hyderabad, where business activities are less diversified (which is borne out by a smaller association between occupation and earning group) than for Bombay, earners with a specific education cluster in a specific earning group. Further interesting points could be derived if the association between education and earning group, is derived under each of the following groups: occupation, age and industry. For want of data on 3-way classifications for other cities, these have not been attempted.

Age and Earning Group. This association has been calculated only for Bombay city. While the products moment correlation coefficient between age and earning levels is positive and is 0·4393, predictive association coefficients are moderately high. The positive correlation coefficient indicates that the earnings increase with maturity indicated by age of the individual. The value of λa is higher than the value of λb. This implies that earners belonging to a certain earning class, cluster in a specific Age group, while the earners in a specific age group do not cluster in a specific earning class. All persons with higher age need not be in a specific high earning class, while the persons in high earning class must be drawn from high age group. The frequency tables by age and earning group do indicate this nature of distribution for Bombay city.

Association among the Socio-economic Factors. The table gives the coefficients of association between (1) education and occupation, (2) education and industry, and (3) occupation and age, for those urban centres, for which necessary data could be acquired. These measures indicate how the socio-economic factors are related among themselves. The association between education and occupation is fairly high for Bombay, Calcutta, Poona and Hyderabad, and it is quite weak in Hubli city. This indicates that in the industrially more advanced centres, the occupational structure depends on the specific skill structure and hence the educational structure. The earners in specific occupations are largely drawn from specific educational groups and vice versa. In a city like Hubli, the occupation structure is not diversified nor is the education structure. The association between education and industry is however less pronounced than that between education and occupation. The former is however quite large for Hubli. The association between occupation and age is very weak indicated by small coefficients. λa for Bombay is zero which implies that the earners in each age group are clustered in the same occupation; the modal occupation for each age group is the same.

The analysis of the inter-relationship among the socio-economic factors taken two at a time, does throw out some interesting results. But this has the limitation that we are not seeking any causal relationships and we are not entangling the effects through the third set of factors when association between any two factors is considered. For the latter purpose coefficients of partial association must be worked out. But for many cities, tables by 3-way and multiple-way classifications are not available. In a later section, we are using the technique of multiple regression, to isolate the contribution of each *S-E* factor, when the other factors are held constant, for the data on Bombay city.

Income Distribution According to Socio-economic Characteristics

After describing the association of socio-economic variables with the individual incomes, we now consider another aspect of the problem, viz., the distribution of the urban earnings in relation to different socio-economic variables. Income distribution studies are generally done with respect to size of incomes, without considering the differences in the socio-economic characteristics of the earners. But this does not reveal the full picture. How is the distribution of earnings in the same occupation, in the same industry, or in the same age group? Is inequity of earnings more among males than among females? Do all the educated persons receive similar rewards for their specific skills? These are relevant questions in the study of income distribution. In the following, we propose to analyse these questions with reference to Bombay city. It is hoped that the results in connection with Bombay may shed light on the state of income distribution in other major cities of the country.

Table 2 gives the detailed results about the income distribution as among different educational, occupational, industrial classes, sex, age and employment status. If persons are classified according to different educational levels, and income distribution in each education class is studied, we find in case of Bombay that income distribution is positively skewed, the degree of skewness differing from one education class to the other. All the coefficients were found to be statistically significant. The distribution among the medical and technical graduates tends to the normal distribution since skewness is near zero and kurtosis is near two (3 being for normal distribution). The distribution is most skewed among the illiterates. Generally the distributions are leptokurtic with very large peak, except in the case of medical and technical graduates.

From the concentration ratios, we find that the incomes are generally inequitably distributed within each education class, the degree of inequality being the highest in the case of Arts and Commerce graduates, and non-graduate (technical) earners. The larger the mean income the smaller is the skewness in the distribution.

Income-distribution in each occupational classification is generally highly positively skewed and leptokurtic. The skewness is however small in case of managerial administration and executives, professional technical and related (superior) personnel, and clerical earners. The distribution in the case of managerial administration, and professional (superior) class is nearly mesokurtic (similar to normal distribution). The inequality is the lowest among the clerical earners, and the highest for medium and large scale trading class. The ordering of occupations according to intra-occupational income distribution for Bombay is broadly comparable with that obtained for the United States. The following table presents a broad comparative picture.

Occupation	*Ranking by Concentration Ratio (In descending order of concentration)*	
	United States	*India*
1. Managerial	2	3
2. Professional	3	2
3. Clerical	5	5
4. Sales	1	1
5. Skilled, Semi-skilled and Unskilled	4	4

Note.—The data for the United States are derived from Table 6·4 B of Irving B. Kravis, *The Structure of Income*, University of Pennsylvania, 1962, p. 196.

The distribution of income among the earners in the processing and manufacturing industry is most positively skewed and highly leptokurtic. The inequity in the Personal Services and other services industry is the highest. Concentration ratio for the organized industries of processing and manufacturing and transport and communications, however, is relatively low, for, about 85% of the employees in skilled and semi-skilled occupations, and about 37% of the employees in clerical occupations are employed in these two industries only and the concentration ratios for these occupations are quite small as seen earlier. Again, the larger the mean income of a group, the smaller are the skewness and kurtosis.

Distribution of earnings among employers is less skewed and less peaked than among others. Inequity, is however the least among the employees, but their distribution is most skewed and most leptokurtic. Again, the larger the mean income, the smaller the skewness and kurtosis.

The mean income increases with the age group, until the age of 59, and falls slightly for the age group, 60 and above. This was also confirmed by +*ve* correlation as noted earlier. The distribution is the most skewed for the age group 10-19 years and the least skewed for the 60 and above group. All distributions are leptokurtic. The concentration ratio is the lowest for the age group 20-29 years and goes on increasing thereafter.

The mean incomes are higher for males than those for females. It is interesting to note that inequity in the distribution for the males is almost the same as that for the females, while both distributions are positively skewed and leptokurtic. That the distribution for females is more skewed than that for males, substantiates the hypothesis stated by Miller, that the inclusion of women in the over-all population of earners would introduce a source of heterogeneity (and asymmetry) in the income-curve.[8]

From the above, it will be seen that even if the earners are classified into different homogeneous groups, homogeneity being defined in terms of different educational levels, occupations, industries, employment status, age and sex, the distribution of income is still not symmetric. Symmetry should have been expected on the basis of the traditional hypothesis that since abilities are normally distributed in a homogeneous class, the incomes must also be so distributed. H. P. Miller found that income distributions only for the white collar workers, blue collar workers and independent professionals, non-farm proprietors, and managers and officials, are 'essentially symmetrical'.[9] The implication is that symmetry and normality of income distribution can be observable for workers within particular occupational groups, since the sources of distortion to normality viz. existence of non-competing groups and influence of inherited wealth are eliminated. But from the present data of earnings according to occupational intra-occupation earnings are not normally distributed for all occupations. The distributions tend to normality in case of only the managerial, administrative and executive occupations, professional, technical and related occupations (superior) and clerical occupations. This result is to some extent in conformity with what Miller found in the case of the United States.

Another interesting feature observed uniformly in case of the nature of income distribution for different socio-economic groups is that the coefficients of skewness and kurtosis for the high (mean) income socio-economic class (*e.g.* managerial administrative and executive group in case of occupation, medical and technical graduate group in case of education, and so on) are relatively small as compared to those observed for other classes. This may imply that earnings tend to be normally distributed for high income groups while they are highly skewed and highly leptokurtic in the case of low income groups. Symmetry for higher income groups might be the result of ability and or capacity to get education, previous income, inherited wealth, etc. of the fathers, which have an impact on the sons' capacity of entry into high paying occupations. It is difficult to establish that all these factors are normally distributed and are additive in nature. Even if they are not normally distributed, the incomes might be normally distributed on account of the possibility of a multiplicative model working resulting in normality. The same cannot be held in case of the persons in other occupations, for this class may consist of highly heterogenous characteristics in respect of education, and also, the entry into these occupations does not generally have restrictive prerequisites as in the case of high paying occupations.

Contribution of Socio-Economic Factors to Individual Earnings

We have up till now only studied the extent of predictive association as between earnings and different socio-economic factors, without considering the cause and effect relationship. The analysis in the preceding section does not also imply any causal hypothesis. If the income distribution for the earners belonging to any socio-economic class is asymmetrical, or highly unequal or peaked, all these characteristics are not due to the fact that they belong to that class. It is more appropriate that such an analysis should be based on the contributions made by the *S-E* factors to the earning levels and the distribution. In this and in the following sections, we attempt to quantify the contribution of the socio-economic factors to the earnings, and to the distribution of earnings.

A modified regression model using dummy variables, described on page 313 is employed to measure the contribution of different socio-economic factors. As a first step, only the additive model is used, and interactions between different socio-economic factors are not considered. The most important restriction in this type of analysis is the assumption that each socio-economic explanatory factor affects the dependent variable, viz., earning level, in an independent manner, regardless of the values of the other explanatory factors. Though this is highly restrictive, it can be taken as an approximation of reality. We considered in all 47 variables, derived from the detailed classification of the major socio-economic factors as determinants of the individual earnings in the two regression models, one linear and another semi-log-model. Thus, ten education classes, nine occupation classes, nine industry classes, etc. are considered separately. It may be noted that the regression coefficient of any *S-E* class unlike in the usual regression models, indicates the deviations from the average effect of all the categories of that socio-economic factor. The results are presented in Table 3. Thus the coefficient for 17th variable shows that medical or technical graduate education adds to the mean contribution of all education by 142·83 points (Rupees). Similarly there are, 'mean contribution of occupation', 'mean contribution of industry' and so on; and the regression coefficients indicate either positive or negative contribution to the mean income of the respective major socio-economic factor.

For education class, as should be expected, the highest contribution to earnings is made by the medical, technical and science and technical graduate education. Next in order are the contributions from (1) commerce, law, and arts mixed group (in two courses) graduate education, (2) non-graduate technical education, (3) under graduate diploma education, (4) graduation in arts and science, or in science, (5) secondary education with matriculation, (6) graduation in arts education, and so on. It may be interesting to find some coefficients negative. Thus, the fact that one is illiterate reduces the average education effect by 15·81 points. The extent of reduction is lowered if one gets primary education. The combination of science with law which is obviously not a healthy combination from the point of view of earnings, means a significant loss to the recipient of that education. This result may seem paradoxical, because the contribution of being illiterate is also not that small. But this coefficient is not well estimated as may be seen from very large standard error for it. Hence we may ignore this paradoxical result. Some insight may be obtained from these coefficients about the priorities of education from the point of view of economic returns.

The fact that one belongs to the managerial, administrative and executive occupation, raises his earnings tremendously as compared to the contribution of other occupations. This is also expected. On the other hand, the fact that one belongs to the clerical occupation, reduces his earnings more in relation to the ' occupation average of earnings '. Professional, technical and related occupations (superior) have the next highest positive contribution to earnings, while the lower professional technical and related occupations have the next highest negative contribution to earnings. The coefficients reveal very interestingly, the expected order of importance of the occupations to earnings. Coefficients in both the linear and semi-log linear models by and large indicate the same ordering of occupations.

The industry known as medical and health, education and public administration has the highest contribution to the (linear model) ' industry average ' of earnings. The fact that one belongs to agriculture, primary industries, mining and quarrying or to personal and other services would mean actually the reduction in his earnings, in relation to the industry average. The negative coefficients in case of construction, trade and commerce, transport and communications (on linear model only) electricity, gas, water and sanitary services, however are somewhat puzzling. Perhaps, this might be suggestive of low average earnings as seen above (as in the case of electricity, gas and sanitary services) and uncertainty of receipts (as in the case of trade and commerce, and possibly, in the case of construction and transport and communications), associated with these.

That higher family income contributes to the individual earnings (through the channels of possibility of receiving education and easy entry into high paying occupations by virtue of social prestige and contacts largely determined by family income) is well known. The coefficients reveal an extremely realistic ordering of family income groups from the point of view of their impact on individual earnings.

Similarly the fact that greater maturity has a greater contribution to earnings is broadly revealed by the regression coefficients in the linear model. In the semi-log-model, the results are more realistic, for, the coefficient indicates that contribution of age after 50th year declines, as the tenacity to work declines and the desire for retired life increases generally after the fifties.

The contribution of the male factor to the average earnings is more than that of the female factor, for generally there is a possible discrimination and some preference for the male workers for high paying jobs.

The multiple correlation coefficient of the linear model is 0·41, which implies that about 17% of the variation in Y is explained by the *S-E* factors.

The smallness of the explained variation, may be due to the fact that many interaction components for the *S-E* factors and such factors as caste, region, etc. are not included in the model. (the value of R^2 for the semi-log-linear model is not yet calculated.)

The standard errors of most of the regression coefficients are however small in both the models. The parameters are fairly well estimated. No significance tests or Analysis of Variance tests have been carried out, because the assumptions of normal distribution cannot be presumed without testing. Table 4 reveals some interesting properties of the distributions of the total earnings, socio-economic earnings (estimated from the model), and residual earnings.

While the skewness and kurtosis for the distribution of total earnings are very large, those of the distribution of socio-economic earnings are relatively very small. The skewness and kurtosis for the residual earnings are quite large in the linear model, while they are very small in the semi-log model. Large-sample tests could be applied here. All the coefficients are found to be highly significant statistically. Nevertheless, looking at the relative magnitudes, one could infer that the socio-economic earnings are more symmetrically distributed than the total earnings or the residual earnings in the linear model. The error-term in the semi-log model appears to *tend to* be normally distributed.

Distribution of the Socio-economic Earnings

Let us presume that there are only socio-economic factors working in a system and the influence of the residual factors is nil. It is interesting to study the nature of the distribution of the socio-economics earnings. Table 5 summarises the concentration ratio of the socio-economic earnings distribution, and the contribution made by the major *S-E* factors to the Socio-Economic-Concentration Ratio. The factor which introduces the highest inequality in the distribution of *S-E* earnings, is the family income background of the earners. The next factor in importance is the occupation of the earners. The fact that the different earners belong to different occupational groups, does increase by large magnitude the inequality of the distribution of the socio-economic earnings. It is interesting to note that the fact that the earners acquire different types of education, increases the inequality of distribution only by a small magnitude. Another striking point is that the concentration ratio of the socio-economic earnings and the concentration ratio of the total earnings, differ by very small margin Rs. 0·4689—0·4611= 0·0078. This indicates that the distribution could have been only slightly more equitable, if earners were only socio-economic beings and nothing else than that. The imposition of residual factors distorts the distribution towards slightly greater inequality. The detailed results in Table 6 present some interesting points. The acquiring of secondary education and under-graduate diploma education, makes a negative contribution to the total socio-economic concentration ratio. Similarly, belonging to age group 30-39 or belonging to the industry, trade and commerce, helps in reducing the inequality in the distribution of socio-economic earnings.

Rates of Return on Education Expenditures

The coefficients of marginal contribution of different types of education to the earnings of an individual (defined as the deviations from average education effect) can be used for deriving the rates of return on education expenditures. On the basis of the assumption that total direct cost of education consists of the costs that students bear on books, transportation (to and from School), additional clothing, etc. (the foregone earnings are not considered). The recurring organizational expenditures (by the educational institutions) were derived from the average education expenditures for different types of education until the student completes that education in toto. The coefficients of marginal contribution were used to derive the annual returns of a type of education (defined in a particular sense). The ratio of the annual educational returns to the direct costs of completing a type of education is called as the annual rate of return to education. Thus, for completing an Arts degree course, the cost consists of school costs, plus college costs plus the additional expenditures by the student throughout his education. The coefficient of annual contribution of Arts graduation is Rs. 214·8. This divided by the total costs is the annual rate of return on Arts graduation. Table 7 shows such rates of return for different types of education.

The annual rates of returns of different types of education show that mixed groups like Arts and Commerce, Commerce and Law, etc. are highly profitable. Since, the costs of certain types of education are very high, the rates of return on them defined in this sense become low.

Appendix

TABLE 1

Measure of Association Based on Optimal Prediction, for Socio-Economic Characteristics, for Urban Centres

Factor A	*Factor B*	*Urban Centres*	*Asymmetrical Optimal Prediction* *of B from A* λb	*Asymmetrical Optimal Prediction* *of A from B* λa	*Symmetrical Optimal Prediction*
Education	Occupation	Bombay	0·1786	0·1245	0·1566
		Calcutta	0·1355	0·1719	0·1536
		Hubli	0·0991	0·0774	0·0088
		Hyderabad	0·0639	0·1097	0·0859
		Poona	0·0816	0·1220	0·0986
Education	Industry	Bombay	0·0497	0·0432	0·0465
		Hubli	0·0981	0·0229	0·0643
		Poona	0·0208	0·0441	0·0309
Education	Earning Group	Bombay	0·0484	0·1108	0·0757
		Hyderabad	0·1046	0·1295	0·1165
Occupation	Age	Bombay	0·0311	0	0·0198
		Hyderabad	0·0166	0·0377	0·0286
Age	Earning Group	Bombay	0·0454	0·0759	0·0602

(Product moment correlation co-efficient between age and earning group=0·4393)

			Measures based on Optimal Prediction of order *Conditional Probability of Like Ordering*	*Conditional Probability of Unlike Ordering*	*Coefficient of Association*
Education	Earning Group	Bombay	0·7641	0·2359	0·5282
		Hyderabad	0·7780	0·2220	0·5560
Earning Group	Occupation	Baroda	0·0407	0·0707	0·0572
		Bhopal	0·0153	0·0067	0·0112
		Bombay	0·0542	0·0683	0·0634
		Cuttack	0·0459	0·0483	0·0471
		Delhi	0·1007	0·1516	0·1282
		Durg	0·0035	0·0043	0·0038
		Gorakhpur	0·0211	0·0597	0·0391
		Hubli	0·0096	0·0132	0·0115
		Jamshedpur	0·0941	0·0886	0·0907
		Lucknow	0·0483	0·0491	0·0487

TABLE 1 (*contd.*)

			Measures based on Optimal Prediction of order		
Factor A	*Factor B*	*Urban Centres*	*Conditional Probability of Like Ordering*	*Conditional Probability of Unlike Ordering*	*Coefficient of Association*
		Poona	0·0213	0·0041	0·0124
		Raipur	0·0000	0·0467	0·0229
		Secunderabad	0·0478	0·0407	0·0464
		Surat	0·0131	0·0383	0·0265
Earning Group	Industry	Baroda	0·0480	0·0056	0·0261
		Bombay	0·0953	0·0877	0·0910
		Delhi	0·0053	0·0519	0·0112
		Durg	0·1145	0·0322	0·0877
		Hubli	0·1370	0·0006	0·0846
		Poona	0·0226	0·0036	0·0316
		Puri	0·0046	0·0000	0·0031
		Raipur	0·0710	0·0403	0·0611
		Sambalpur	0·0299	0·0000	0·0183
		Secunderabad	0·0021	0·0000	0·0012
		Surat	0·0069	0·0035	0·0051

TABLE 2

COEFFICIENTS OF INCOME DISTRIBUTION ACCORDING TO SOCIO-ECONOMIC CHARACTERISTICS OF THE EARNERS

For Bombay City

Socio-Economic Class	*Mean Income Rs.*	*Concentration Ratio*	*Coefficient of Skewness*	*Coefficient of Kurtosis*
I. *Education*				
1. Illiterate	97·00	·3554	12·86	255·13
2. Literate and Primary	140·03	·3643	9·04	108·42
3. Secondary and Matriculate	259·89	·4594	4·82	28·53
4. Under-graduate Diploma	346·64	·4294	3·77	17·59
5. Arts Graduate, Commerce and Law, Arts and Law	471·77	·4494	2·64	8·88
6. Arts and Commerce Graduate	659·95	·5010	1·73	4·43
7. Science Graduate, Arts and Science	527·38	·4290	2·47	8·06
8. Science and Law	597·88	·3294	2·08	5·97
9. Non-graduate (Technical)	392·18	·5010	3·20	12·53
10. Medical Graduate, Technical, Science Graduate	1107·87	·3818	0·61	1·55

TABLE 2 (*contd.*)

Socio-Economic Class	*Mean Income Rs.*	*Concentration Ratio*	*Coefficient of Skewness*	*Coefficient of Kurtosis*
II. *Occupation*				
1. Managerial, Administration and Executive	783·55	·4549	1·29	3·07
2. Subordinate Administration and Executive	289·21	·2438	4·63	54·72
3. Clerical	178·23	·2015	1·82	8·71
4. Lower Administrative	96·85	·4645	19·91	433·67
5. Professional, Technical and Related (Superior)	738·94	·4417	1·50	3·71
6. Lower Professional and Related	197·79	·3586	5·79	60·13
7. Financial and Commercial (Non-trading)	375·45	·4631	3·26	13·15
8. Medium and Large-scale Trading (Retail Trading)	251·09	·5799	4·23	21·85
9. Skilled, Semi-skilled and Unskilled Manual	96·47	·2717	8·19	224·35
III. *Industry*				
1. Agriculture, Primary Industries, Mining and Quarrying	127·51	·4511	7·62	83·13
2. Processing and Manufacturing	138·26	·3252	9·41	110·79
3. Construction	155·72	·5508	6·27	47·20
4. Electricity, Gas, Water and Sanitary Services	119·54	·4332	9·21	92·30
5. Trade and Commerce	249·64	·5496	4·32	22·80
6. Transport, Stores and Communication	165·85	·3680	7·39	70·65
7. Medical and Health Education and Public Administration	220·53	·5153	5·15	31·22
8. Personal Services and Other Services	111·06	·6176	7·01	57·51
9. Acitvities inadequately specified	217·21	·4368	5·64	39·05
IV. *Employment Status*				
1. Self Employed	212·61	·5866	4·82	27·86
2. Employer	503·72	·5563	2·26	6·86
3. Employee	140·07	·3822	8·40	91·50
V. *Age*				
1. 10-19 years	56·83	·4196	15·80	356·77
2. 20-29 years	111·18	·3640	10·99	199·62
3. 30-39 years	172·29	·4175	6·77	232·63
4. 40-49 years	217·60	·4847	5·08	30·87
5. 50-59 years	237·46	·5399	4·47	24·09
6. 60 and above	234·55	·6430	4·15	20·08
VI. *Sex*				
1. Male	173·07	·4667	6·37	48·86
2. Female	89·76	·4583	11·10	164·47

TABLE 3

CONTRIBUTIONS OF THE SOCIO-ECONOMIC FACTORS TO INDIVIDUAL EARNINGS

Bombay City

S. No.	*Socio-Economic Factor*	*Marginal Contribution to Individual Earnings (Regression Coefficients)*			
		Linear Model	*Standard Errors*	*Semi-Log Model*	*Standard Errors*
1.	General Constant Effect	162·44	(3·16)	2·03	(0·004)
	Education	Deviations from Average Education-Effect			
2.	Illiterate	—15·81	(4·36)	—0·05	(0·005)
3.	Literate and Primary	—2·49	(4·36)	0·01	(0·005)
4.	Secondary Matriculate	27·86	(8·89)	0·08	(0·011)
5.	Under-graduate Diploma	36·90	(22·76)	0·10	(0·028)
6.	Arts Graduate	17·88	(25·77)	0·13	(0·032)
7.	Commerce and Law Graduate Law Graduate Arts and Law Graduate Arts and Commerce Graduate	136·63	(35·58)	0·18	(0·044)
8.	Science Graduate, Arts and Science	32·93	(35·11)	0·13	(0·138)
9.	Science and Law	—112·78	(112·70)	0·06	(0·048)
10.	Non-graduate Technical	44·32	(39·3)	0·12	(0·057)
11.	Medical Graduate, Technical Graduate, Science and Technical Graduate	142·83	(46·56)	0·18	(0·027)
	Occupation	Deviations from Average Occupation-Effect			
12.	Managerial, Administrative and Executive	137·11	(22·14)	0·23	(0·023)
13.	Subordinate Administrative and Executive	3·70	(18·97)	0·13	(0·014)
14.	Clerical	—31·36	(11·45)	0·04	(0·019)
15.	Lower Administrative	30·66	(15·65)	—0·05	(0·019)
16.	Professional, Technical and Related Occupations (Superior)	55·09	(29·24)	0·21	(0·036)
17.	Lower Professional Technical and Related	—27·23	(17·66)	0·05	(0·022)
18.	Financial and Commercial (Other than commodity trading)	8·03	(24·12)	0·18	(0·030)
19.	Medium and Large-scale, Trading and Essentially Small Retail Trading	29·84	(15·72)	0·05	(0·019)
20.	Skilled, Semi-skilled and Unskilled Manual	—7·57	(4·12)	—0·04	(0·005)

TABLE 3—(*contd.*)

S. No.	*Socio-Economic Factor*	*Marginal Contribution to Individual Earnings (Regression Coefficients)*			
		Linear Model	*Standard Errors*	*Semi-Log Model*	*Standard Errors*
	Industry	Deviations from Average Industry-Effect			
21.	Agriculture, Primary Industries, Mining and Quarrying	—33·01	(31·24)	—0·04	(0·038)
22.	Processing and Manufacturing	3·88	(4·58)	0·03	(0·006)
23.	Construction	—23·87	(22·00)	—0·04	(0·027)
24.	Electricity, gas, water and sanitary services	—1·02	(25·08)	—0·02	(0· 30)
25.	Trade and Commerce	—3·61	(11·14)	—0·01	(0·013)
26.	Transport, Storage and Communication	—6·02	(9·75)	0·02	(0·012)
27.	Medical and Health Education and Public Administration	13·56	(12·53)	—0·01	(0·015)
28.	Personal Services and other Services	—6·68	(10·00)	—0·09	(0·012)
29.	Activities, inadequately specified and unproductive sources of income	0·03	(19·42)	—0·01	(0·024)
	Employment Status	Deviations from Average Employment-Status-Effect			
30.	Self employed	16·31	(5·39)	—0·02	(0·006)
31.	Employer	138·86	(5·39)	0·12	(0·006)
32.	Employee	—10·16	(2·00)	—0·003	(0·002)
	Family Income (Rs.)	Deviations from Average Family-Income-Effect			
33.	0– 49	—81·72	(14·18)	—0·42	(0·017)
34.	50– 75	—83·60	(11·40)	—0·20	(0·014)
35.	76–100	—61·32	(7·81)	—0·06	(0·010)
36.	101–150	—47·77	(6·24)	—0·02	(0·008)
37.	151–250	—30·64	(5·74)	0·02	(0·007)
38.	251–500	13·73	(6·78)	0·12	(0·008)
39.	501–1000	132·12	(13·27)	0·25	(0·016)
40.	1001 and above	1020·12	(21·38)	0·56	(0·026)
	Age (Years)	Deviations from Average Age-Effect			
41.	10–19	—50·65	(14·18)	—0·25	(0·017)
42.	20–29	—33·78	(4·69)	—0·07	(0·006)
43.	30–39	3·74	(4·69)	0·04	(0·006)
44.	40–49	29·54	(6·24)	0·074	(0·008)
45.	50–59	40·36	(9·22)	0·069	(0·011)
46.	60 and above	53·37	(17·00)	0·03	(0·021)
	Sex	Deviations from Average Effect			
47.	Male	6·23	(1·03)	0·02	(0·001)
48.	Female	—63·56	(10·39)	—0·17	(0·013)

TABLE 4

PROPERTIES OF THE DISTRIBUTION OF THE TOTAL EARNINGS, SOCIO-ECONOMIC EARNINGS AND RESIDUAL EARNINGS

Bombay City

Characteristics of the Distribution	*Total Earnings*	*Linear Model*		*Semi-Log Model*
		Socio-Economic Earnings	*Residual Earnings*	*Residual Log Earnings*
Mean	162·72	162·21	0·47	2·64
Standard Deviation	513·8	212·37	467·23	0·57
Coefficient of Skewness	59·68	4·41	71·75	0·2439
Coefficient of Kurtosis	4980·85	24·75	...	6·1395
Multiple correlation Coefficient (R)	0·41 (R^2=16·81)			

TABLE 5

CONTRIBUTION OF THE SOCIO-ECONOMIC FACTORS AND RESIDUAL FACTORS TO THE CONCENTRATION RATIO

Bombay City

Factor	*Contribution to Concentration Ratio*	*Percentage to total S-E Concentration Ratio*
1. Education	0·0131	2·84
2. Industry	0·0103	2·23
3. Occupation	0·0624	13·53
4. Family Income	0·2714	58·85
5. Age	0·0466	10·13
6. Employment Status	0·0385	8·35
7. Sex	0·0188	4·07
8. Total Socio-Economic factors, i.e., Socio-Economic Concentration	0·4611	100·00
9. Total Earnings	0·4689	...
Residual factors and Interaction between residual and Socio-Economic factors	0·0078	...

TABLE 6

CONTRIBUTION OF THE SOCIO-ECONOMIC FACTORS TO THE CONCENTRATION RATIO

Bombay City

Socio-Economic Factor	*Concentration Ratio*
Education	
1. Illiterates	0·0094
2. Literates and Primary	0·00004
3. Secondary and Matriculate	—0·0104
4. Diploma Holder	—0·0023
5. Arts Graduates	0·0009
6. Commerce and Law, etc.	0·0078
7. Science, Arts and Science	0·0012
8. Science and Law	0·0002
9. Medical and Technical	0·0051
10. Non-graduate (Technical)	0·0012
Industry	
1. Agriculture	0·0004
2. Processing and Mfg.	0·0072
3. Construction	0·0006
4. Electricity, Gas, etc.	0·000015
5. Trade and Commerce	—0·0013
6. Transport and Communications	—0·00003
7. Medical, etc.	0·0015
8. Personal and other services	0·0019
9. Other Activities	0·0000
Family Income Rs.	
1. 0–49	0·0280
2. 50–75	0·0172
3. 76–100	0·0169
4. 101–150	0·0017
5. 151–250	0·0012
6. 251–500	0·0068
7. 501–1000	0·0401
Age	
1. 10·19	0·0084
2. 20·29	0·0173
3. 30·39	—0·0003
4. 40·49	0·0094
5. 50·59	0·0080
6. 60·69	0·0038
Employment Status	
1. Self-Employment	0·0043
2. Employer	0·0293
3. Employee	0·0049

TABLE 6—(*contd.*)

Socio-Economic Factor	*Concentration Ratio*
Sex	
1. Male	0·0017
2. Female	0·0171
Occupation	
1. Managerial, etc.	
2. Subordinate Executive	
3. Clerical	
4. Lower Administration	
5. Professional (Superior)	
6. Lower Professional	
7. Financial and Commercial	
8. Trading	
9. Manual Occupations	
Total socio-economic concentration ratio	0·4611

TABLE 7

RATES OF RETURN OF DIFFERENT EDUCATION CATEGORIES

Education Type	*Annual Returns Per Earner*	*Total Direct cost of Completing Education Per Student*	*Annual Rates of Return*
1. Secondary and Matriculate	314·8	1472·7	0·2137
2. Under-graduate Diploma	442·8	5972·7	0·07413
3. Arts Graduate	214·8	3189·9	0·0673
4. Mixed Graduate	1663·2	3792·1	0·4286
		3775·5	0·4404
		2643·4	0·6292
		3246·1	0·5124
5. Science Graduate	394·8	7443·1	0·0860
6. Non-graduate Technical	531·6	7903·1	0·0673
7. Medical Graduate	1713·6	12117·9	0·0142
8. Technical Graduate	1711·6	11348·3	0·0151

Notes.—The estimates of direct costs are derived, from a research study 'Operating Costs of Higher Education in Bombay University' by P. R. Panchamukhi.

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Chapter Twenty-Five

Education of Farmers and Productivity

D. P. CHAUDHRI*

One of the oft repeated assertions in connection with the problem of slow growing agricultural sector of under-developed countries is that cultural, sociological and psychological factors are a hinderance to the development of economic cost-return calculation attitudes which are so very crucial to economic growth.[1] These hindering influences are weakened over time through the persistent economic pressure, demonstration effect, intermixture of culture and possibly, purposive formal education.[2] The time pattern of the weakening of these hindering influences might be significantly affected by purposive education.[3] Education in every society is purposive; what distinguishes modern education from traditional education is the emphasis on rationality rather than faith. Therefore 20th century education is likely to influence man's attitude to nature, to his fellow-beings and to his worldly prospects. The influence is likely to result in a shift from the conventional mythological and fatalistic attitudes to rational and economically more pragmatic ones.[4] This shift may not be revolutionary because change through education is a slow process. If education is able to make a perceptible impact on these factors, the role of education could be treated as growth promoting.[5] But in some cases, the effect of education may be practically neutralized by strong mythological and fatalistic attitudes and no perceptible effect is observed, though the growth retarding attitudes might have been considerably weakened in the process, but a break through is not visible. While in other cases, education might have minimized the influence of growth-retarding attitudes to such an extent that change would be reflected in the economic behaviour of the individuals or the group.

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[1] See Shils (1), Carstairs (2), Chauhan (3), Gist (4), Srinivas (5), Zinkin (6), Majumdar (7), Bailey (8), Kusum Nair (9), E.D.C.C. (12), Lindblom (10), and particularly Singh (11).

[2] See Shils (1), Srinivas (5), Singh (11), Kuznets (13), Myers (14) and Johnson (15). The experience of Japan as reported by Dore (16) also supports this view.

[3] Harbison and Myers (17), Harry Johnson (15), Galbraith (18), Lewis (19), Vaizey (20) and particularly Schultz (21) while discussing policy prescriptions for economic development emphasised on education in particular, probably for this reason.

[4] See Dandekar (22), Curle (23) and Ward (24).

[5] Education could be just a catalytic agent or it could be a causal factor in bringing about change.

A study of the growth pattern of the agricultural sectors of the developed countries reveals that a few countries that have an impressive record in this field, are very adept in the difficult art of increasing agricultural production, while decreasing both labour and land devoted to farming.[6] Recent studies on the sources of economic growth indicated that a substantial part of the increase remains unexplained when we try to attribute growth to the conventional factors of production. These are the countries where during this period in addition to improvements in the techniques of production and quality of farm capital, there has been substantial improvements in the educational level of the farm workers.

While looking for the factors responsible for the sluggishness of the agricultural sectors of most of the present day under-developed countries, we have to keep these international experiences in mind, but direct lessons for under-developed countries could be deceptive.

The Hypothesis

A study of the Indian Agricultural sector, in this connection would be rewarding, because it presents a striking picture of contrasts. Indian agriculture is sluggish; but not in Punjab. In Punjab, agriculture is buoyant, but not in terms of yield per acre. Madras has done remarkably well in raising physical yields per acre, but not so well in shifting the pattern of crops towards the more lucrative varieties. The crop pattern has responded remarkably in Gujarat, but physical yield per acre is comparatively stagnant and acreage is growing slowly. Rajasthan's expansion of acreage cultivated is staggering but physical yields per acre seem to be falling.[7]

Our knowledge of input-output relations in Indian agriculture is rather meagre.[8] Co-existence of a high degree of complementarity along with pervasive substitution possibilities among agricultural inputs makes the input-output relations extremely complex. In the absence of precise knowledge of the complex input-output relations one is tempted to suggest that the regional contrasts in agricultural yields and crop responses may partly be explained by the differences in the quality of ' the man behind the plough '.

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[6] Schultz (25), Denison (26), Lebergott (27).

[7] *Contrasts in Indian Agriculture—Regional Variations in Agricultural Development*, Agro Economic Research Centre, Delhi University (Mimeographed). *See* also B. S. Minhas and A. Vaidyanathan (20).

[8] Indian Council of Agricultural Research, Institute of Agricultural Research Statistics and some of the Agricultural Universities have made a beginning in this direction in a big way.

Quality of farm workers would depend on a number of factors like heredity, environment, nutrition levels, formal education, etc. Among these the most promising and tangible is formal education. The variations in the level of formal education of the farm workers in different parts of India are no less striking than the variations in the level ot agricultural productivity.

The level of performance of these farm workers would be reflected in the level of agricultural productivity, both per acre and per worker. Agricultural productivity is a function of a number of variables. For example, the money value of yield per acre or per worker would depend upon the choice of crop, its relative price, the land fertility, availability and use of irrigation, fertilizer, pesticides, improved varieties of seeds, improved agricultural implements, etc. Most of these factors, which cause variations in productivity are influenced to a considerable extent by the human factor. Formal schooling may affect the individual's attitudes, economic ambitions, effective working ability and receptivity to new ideas. In case it does, it would be reflected in the productivity per acre and per worker. In the next sections therefore, we examine the following hypotheses:

a. Level of agricultural productivity is significantly related to the farm workers.

b. Use of modern agricultural inputs is significantly related to education.

Concepts and Data

The farm workers in India do not have formal training or specific education in agriculture.[9] Those workers who have had the benefit of formal schooling invariably received general education. We shall have three definitions of educated farm workers for our purpose. On a priori reasoning each one of these definitions is relevant for our study.

i. *Percentage of farm workers who are at least able to read and write.* By defining education in this way we can find out whether literacy alone makes any perceptible difference in the level of performance of the farm workers. Emphasis on adult literacy is based on the implicit assumption that apart from the social and political benefits of literacy, it facilitates modernization of agriculture in under-developed countries.[10]

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[9] The small number of agricultural graduates turned out by the agricultural colleges or agricultural universities seek employment in the Govt. agricultural deptts. and do not normally adopt farming as a profession. Agricultural education at the school level is negligible.

ii. *Percentage of farm workers, who completed successfully, at least lower elementary schooling* (4 to 5 years).[11]

Farm workers with education according to this definition do have the advantage of being able to keep record of their financial transactions, get market information through correspondence or regional language newspapers or read extention agency's information leaflets. But their shift from traditional and conservative way of economic behaviour to that of rationalistic and pragmatic one need not be greater than that of just literate workers or even illiterate workers.[12] But the performance of workers with elementary level of education could be better than those without education because of the former's reading and writing abilities.

iii. By giving different levels of formal education different weights according to the completed years of schooling we compute the average years of schooling per 100 farm workers.[13] This would give us a measure of the average level of education of the farm workers in the farming household, district, state or the region. Since education is a continuous process, each year of successfully completed schooling would, to some extent, improve the quality of the worker. In the earlier definitions of education, the idea of continuous improvements in the quality of labour through education was rejected though by implication only. The measure of education proposed here would take this into account.

The data regarding stock of educated agricultural workers in different stages of India is taken from the *Census of India* 1961 Vol. I, part II-B(i), General Economic Tables. The working and non-working population in the rural sector is classified according to their level of education and occupation in these tables. Total number of workers engaged in agriculture (cultivators and agricultural labourers both males and females), are classified according to their level of education namely illiterate, able to read and write, Primary and Junior Basic, Matric and above.

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[10] Blaug (31) p. 17.

[11] In India first stage elementary schools have a 4-year course in some regions and 5-year course in other regions.

[12] Schultz (21).

[13] In case of farm workers who are literates but they either did not attend the school or dropped out before completing first stage elementary schooling (4 years), we give weightage of 1. For farm workers with 4 or more years of schooling the weight would be the number of years successfully spent in the school.

Gross value of agricultural produce is an average of three years 1958-1961 and is computed from the official sources.[14]

Statistical Results

The possibility of a reasonable margin of error in the data pertaining to the value of agricultural yields cannot be ruled out. Therefore, it would be useful to combine these data into categories, obtain contingency tables, and subject them to a non-parametric test.

The three catagories of yield are:

- *a.* Low yield—yield per worker upto Rs. 200 per year.
- *b.* Medium yield—yield per worker from Rs. 200 to Rs. 300 per year.
- *c.* High yield—yield per worker Rs. 300 and above per year; similarly we have three sub-groupings of education.
  - i. Low incidence of education.
  - ii. Medium incidence of education.
  - iii. High incidence of education.

The three categories of yield per acre are:

- *a.* Low yield—yield per acre upto Rs. 100.
- *b.* Medium yield—yield per acre from Rs. 100 to 200.
- *c.* High yield—yield per acre Rs. 200 and above.

We examine the Null Hypothesis that 'Incidence of education per 100 farm workers and agricultural yield per acre and per worker are independent of each other'. The results of tests in all the cases enable us to reject the Null Hypothesis thereby indicating that there is an associative relationship between education (E_1, E_2, E_3) and productivity (Y_1 and Y_2). The contingency tables and the results of tests are given below.

TABLE 1

YEARS OF SCHOOLING AND YIELD PER WORKER

Yield per Worker (Rs.)

E	*Y*	*Upto* 200	200-300	300 *and above*	*Total*
Years of Schooling per 100 Workers	Upto 10	18 (9)	22 (19)	15 (27)	55
	10–20	12 (10)	24 (20)	22 (28)	58
	20 and above	6 (17)	28 (36)	68 (5)	103
	Total	36	75	105	216

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[14] (29) *Growth Rates in Agriculture*, Economic and Statistical Adviser, Ministry of Food and Agriculture, 1964 (Mimeographed).

(30) *Estimates of Area and Production of Principal Crops in India.* Vol. II (Detailed Tables), Directorate of Economics of Statistics, Ministry of Food and Agriculture, New Delhi.

Let the hypothesis be that years of schooling per 100 workers and yield per worker are independent of each other.

$$X^2 = \Sigma \frac{(O—e)}{e} = 32{\cdot}252$$

Degrees of freedom = 4.

Table value of X^2 at 5% level of significance and with 4 degrees of freedom = 9·488.

So the calculated value of X^2 is more than the table value. Therefore our hypothesis is rejected. Hence there is association between years of schooling per 100 workers and yield per worker at 1% level of significance.

TABLE 2

LITERACY AND YIELD PER WORKER

Yield per Worker (Rs.)

		Up to 200	200–300	300 *and above*	*Total*
Literacy	Up to 10	13 (6)	13 (11)	7 (16)	33
	10–20	16 (17)	42 (34)	41 (48)	99
	20 and above	7 (14)	20 (29)	57 (41)	84
	Total	36	75	105	216

Let the hypothesis be that literacy and yield per worker are independent of each other.

$$X^2 = \Sigma \frac{(O—e)^2}{e} = 29{\cdot}093$$

Degrees of freedom = 4.

Table value of X^2 at 5% level of significance and with 4 degrees of freedom = 9·488.

So calculated value of X^2 is more than the table value.

Therefore our hypothesis is rejected.

Hence there is association between literacy and yield per worker at 1% level of significance.

TABLE 3

PRIMARY EDUCATION AND YIELD PER WORKER

Yield per Worker (Rs.)

		Up to 300	300—400	400 *and above*	*Total*
Primary Education	Up to 5	83 (65)	28 (24)	16 (38)	127
	5–10	18 (28)	7 (10)	29 (16)	54
	10 and above	10 (18)	5 (6)	20 (11)	35
	Total	111	40	65	216

Let the hypothesis be that primary education and yield per worker are independent of each other.

$X^2 = \Sigma(O—e)/e = 44{\cdot}510$

Degree of freedom = 4.

Table value of X^2 at 5% level of significance with 4 degrees of freedom = 9·488.

So calculated value of X^2 is more than the table value.

Therefore our hypothesis is rejected. Hence there is association between primary education and yield per worker at 1% level of significance.

TABLE 4

YEARS OF SCHOOLING AND YIELD PER ACRE

Combination of a Number of States, Yield per Acre (Rs.)

		Up to 100	100–200	200 *and above*	*Total*
Years of Schooling Per 100	Up to 20	29 (26)	71 (67)	13 (19)	113
	20–30	4 (8)	24 (20)	6 (6)	34
	30 and above	17 (16)	34 (41)	18 (12)	69
	Total	50	129	37	216

Let the hypothesis be that years of schooling per 100 and yield per acre are independent of each other.

$X^2 = \Sigma(O—e)^2/e = 0{\cdot}538$

Degrees of freedom = 4,

Table value of X^2 at 5% level of significance with 4 degrees of freedom = 9·488. So calculated value of X^2 is more than the table value. Therefore, our hypothesis is rejected.

Hence there is association between years of schooling per 100 and yield per acre at 5% level of significance.

TABLE 5

PRIMARY EDUCATION AND YIELD PER ACRE

Combination of a Number of States, Yield per Acre (Rs.)

		Up to 100	100-200	200 *and above*	*Total*
Primary Education %	Up to 5	31 (20)	82 (76)	14 (22)	127
	5-10	9 (13)	32 (32)	13 (9)	54
	10 and above	10 (8)	15 (21)	10 (6)	35
	Total	50	129	37	216

Let the hypothesis be that primary education (%) and yield per acre are independent of each other.

$X^2 = \Sigma(O-e)^2/e = 11{\cdot}411$

Degrees of freedom = 4.

Table value of X^2 at 5% level of significance with 4 degrees of freedom = 9·488. So calculated value of X^2 is more than the table value. Therefore our hypothesis is rejected. Hence there is association between the primary education (%) and yield per acre at 5% level.

TABLE 6

LITERACY AND YIELD PER ACRE

Combination of a Number of States, Yield per Acre (Rs.)

		Up to 100	100–200	200 *and above*	*Total*
Literacy	Up to 20	35 (31)	85 (79)	13 (23)	133
	20–30	11 (14)	32 (35)	16 (10)	59
	30 and above	4 (6)	12 (14)	8 (4)	24
	Total	50	129	37	216

Let the hypothesis be that literacy and yield per acre are independent of each other.

$X^2 = \Sigma\ (O-e)^2/e = 14{\cdot}773$

Degrees of freedom = 4.

Table value of X^2 at 5% level of significance = 9·488.

So calculated value of X^2 is more than the table value.

Therefore, our hypothesis is rejected. Hence there is an association between the literacy and yield per acre at 1% level.

The results presented above strongly support our hypothesis that there is an associative relationship between the education of the farm workers and the level of agricultural productivity. But one cannot say anything about the direction of causal chain without examining the impact of education on the demand for modern agricultural inputs. We, therefore, examine this phenomenon in the next section.

We examine the linear dependence of demand for fertilizer on the level of education and their associative relationship with the help of a simple linear regression equation of the type.

$$F = a + b\,E$$

When F is the quantity of chemical fertilizer actually used and E represents the level of education. The results are highly suggestive and are presented in Table 7 given below:

TABLE 7

DEMAND FOR FERTILIZER AND LEVEL OF EDUCATION

Variable name	*Constant*	*Co-efficient*	*Significance level t test*	*R^2*	*Corresponding Co-efficient*	*Significance level t test*
Chemical Fertilizer per acre and						
E 1	—·00054	·0179	1%	·869	·932	1%
	(·0002)	(·002)				
E 2	—·00054	·0754	1%	·754	·868	1%
	(·0004)	(·013)				
E 3	—·0001	·6226	1%	·880	·938	1%
	(·0002)	(·069)				
E 4	—·0006	·0103	1%	·893	·945	1%
	(·0002)	(·001)				

Availability of irrigation water is a crucial pre-condition for the use of chemical fertilizers. Therefore, a high degree of association between education and use of chemical fertilizer which we observed above could be due to multicolinearity. Irrigation, the crucial link, may be causing a high degree of association between these two variables. In that case, this association would be just a statistical illusion.

We, therefore examine the role of education, if any, in influencing the demand for fertilizers, when the effect of irrigation is eliminated. For this purpose the following demand relation is proposed:

$F^* = f(L^*, I^*, E^*)$.

where F^* = Demand for chemical fertilizer.[15]

L^* = Area cultivated.

I^* = Irrigated area as a proportion of gross area sown.

E^* = Education.

We, further, assume that our function is homogenous of degree one, in particular of the Cobb—Douglas variety. After normalizing on land and taking logs on both sides we get.

$$\text{Log } F = \text{Log } A + B_1 \text{ Log } I + B_2 \log E.$$

The coefficients of the above equations are estimated by the method of least squares and are based on data pertaining to 256 district level observations drawn from 12 states of India. In each one of the three equations the definition of education changes.

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[15] Our data is of 'actual chemical fertilizer consumption'. Since in most of the areas, so far, the demand for fertilizer has invariably been met and prices of fertilizers have been fixed, we can treat consumption data as a proxy for demand data.

TABLE 8

$$\begin{array}{lllllll}
\text{Log } F & = & -1{\cdot}988 & + & {\cdot}419 \log I & + & {\cdot}899 \log E_1 & \text{(i)} \\
 & & & & ({\cdot}063) & & ({\cdot}128) & \\
\text{Log } F & = & -1{\cdot}943 & + & {\cdot}449 \log I & + & {\cdot}568 \log E_2 & \text{(ii)} \\
 & & & & ({\cdot}060) & & ({\cdot}072) & \\
\text{Log } F & = & -2{\cdot}226 & + & {\cdot}398 \log I & + & {\cdot}920 \log E_3 & \text{(iii)} \\
 & & & & ({\cdot}060) & & ({\cdot}108) &
\end{array}$$

The goodness of statistical fit between education and fertilizer use is presented below:

TABLE 9

EDUCATION AND FERTILIZER USE

	R^2	R—BAR^2	*F Value*	*Level of significance*
(i) E 1	·352	·344	68·62	1%
(ii) E 2	·381	·373	77·70	1%
(iii) E 3	·398	·391	83·62	1%

The net association between education and fertilizer use, represented by partial correlation, is indicated below:

TABLE 10

PARTIAL CORRELATION BETWEEN EDUCATION AND FERTILIZER USE

Variables	*Partial A*	*t-Value*	*Level of significance*
E_1 & F	·403	6·99	1%
E_2 & F	·446	7·94	1%
E_3 & F	·471	8·49	1%

The results presented above clearly demonstrated that education does effect the demand for chemical fertilizer and the association between education and agricultural productivity which we observed earlier, is unlikely to be a statistical illusion. Nevertheless, to verify that the chain of causal links is actually the same as our statistical analysis has indicated, we carry out the following test.

Since our production relation is homogenous of degree one, the marginal relation from the estimated equation can be written

$$\frac{df}{F} = B_1 \cdot \frac{dI}{I} + B_2 \cdot \frac{dE}{E}$$

$$\frac{F_2 — F_1}{F_1} \sim \beta_1 \frac{(I_2 — I_1)}{I} + \beta_2 \frac{(E_2 — E_1)}{E_1}$$

where

F_i = Total demand for fertilizer in state i.
I = Irrigation per acre.
E = Education per acre.
B_i = Regression Coefficients ($i = 1, 2$).

This test implies a rather strong assumption of continuous function, and the influence of other factors like climate, topography, economic overheads, etc. on the demand for chemical fertilizer is assumed to be zero. Therefore, if our predicted difference $\frac{\hat{F}_2 — \hat{F}_1}{\hat{F}_1}$ is reasonably close to the observed $F_2 — F_1/F_1$ difference in two neighbouring states with similar climatic conditions the estimated B_i coefficients and the causation links suggested above would be accepted as valid. If Distt. Hyderabad of Andhra Pradesh is 2 and Distt. Nalgonda of Andhra Pradesh 1, then

$$(\hat{F}_2 — \hat{F}_1/\hat{F}_1) \sim \beta_1 \frac{(I_2 — I_1)}{I_1} + \beta_2 \frac{(E_2 — E_1)}{E_1} = —\cdot 217.$$

The observed difference = —·242.

The two are reasonably close to each other. Similar exercises in other cases within each state lead to the same results. Therefore we can presume that the demand for chemical fertilizers in different states of India is influenced by the level of education of the farm workers in these states.

Conclusion

These statistical findings tend to support (*a*) both our hypotheses that the level of agricultural productivity is significantly related to the education of the farm workers and the pattern of demand for a strategic input like chemical fertilizers is significantly influenced by the education of the farm workers. (*b*) our analysis in the earlier section of the paper.

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Chapter Twenty-Six

The Rationale of Human Capital and It's Productivity Analysis

M. L. PATEL*

Capital is a produced factor of production, which is generally identified as physical capital, for example a plant in a factory or a tractor in a farm. The concept of human capital is a relatively recent development[1] associated with the advent of the economic slogan of planned economic growth. Financial capital is a monetary version of physical and human capital, for it is in a liquid form and is capable of being reduced to any factor of production except that of the ' entrepreneur '. The invention of steam power operated machines introduced the circular method in the use of capital and the production process. Before the industrial revolution the textile industry in Britain experienced retarded productivity due to lack of ready supply of machinery and trained personnel. It was in the 18th century that the most important change affecting industrial history began to take place, namely, the introduction of machinery to aid and supplement the manual methods of production which had persisted with little alteration for hundreds of years. With it came the new organization employing large capital with its corollary of large scale operations. Hitherto the ' capitalist ' had employed only a few persons with whom he had a fairly intimate contact, and along with whom, he frequently worked himself. Thus began the process of divorce between the owner of business and the workers employed by it.[2]

Developing countries to day are confronted with problem of non-availability of indigenous human capital to handle the physical capital imported from developed countries. The major difference between a developed and an under-developed country is that the former possesses the proficiency required to take on and use efficiently the superior techniques of organization and production and the latter has not yet acquired the capacity to do so.[3] Low productivity is an essential feature of under-developed economies. Ragnar Nurkse explains that inducement to invest may be low because of the small buying power of the people, which is due to their small real income, which again is due to low productivity. The low level of productivity, however is the result of small amounts of capital used in production, which in it's turn may be caused at least partly by small inducement to invest.[4] The population pressure is high in most of the developing countries in Asia. The main bulk of manpower which is unprocessed in the developing countries suffers from the problem of disguised unemployment both at family farms and factories. Even in tribal villages, qualified by a subsistence agricultural economy, investment decision to develop human resources is found to be directly related to the economic soundness of the tribal and other backward caste households. Uncertainty on economic returns from expenditure on education has discouraged small farmers from allocating a certain portion of their resources in the development of human capital.[5]

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* The author is thankful to Shri C. S. Pandya, Investigator, Tribal Research and Development Institute, Regional Centre, Mandla, Madhya Pradesh, for drawing out the figures used in this paper.

[1] G. S. Becker, *Human Capital*, Columbia University Press, New York, 1964.

[2] Edward Tregakiss Elbourne, *Fundamentals of Industrial Administration, an Introduction to Management*, *Volume II*, Macdonald and Evans, London, 1949.

[3] World Bank, *The Economic Development of Uganda, A Report*. Johns Hopkins Press, Baltimore, 1962.

Revival of Human Capital

Economic theorists are now coming to recognize that the central process of economic growth is not so much accumulation of material resources as upgrading of human resources alongwith technology. This view of economic development, though not popular among the economists of the eighteenth and nineteenth centuries, has come to the fore in recent years. Alongwith the compared studies of the causes of economic growth, the resurgence owes much to the intellectual leadership of T. W. Schultz and some of his disciples. If human resources and techniques could be improved, the resulting increase in output would enable a cycle of growth to get under way that would gradually free the economy from the hardship and ills to which it had been subjected, even though this might not be an efficient growth path compared with the available alternatives.[6]

The development of human capital depends upon expenditure on education, job training, medical and public health, sanitation, nutrition, clothing, housing and social services.[7] Such expenditure leads to accumulation of human capital which enables a country to raise its level of national income and accelerate the pace of economic development.

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[4] Ragnar Nurkse, *Problems of Capital Formation in Under-developed Countries*, Oxford, Basil Blackwell, Great Britain, 1958.

[5] M. L. Patel and I. Ali, 'Investment in Human Resources in a Tribal Village of Madhya Pradesh', *Investment in Human Resources*, Popular Prakashan, Bombay, 1967.

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Improvement of human capital and qualitative growth of manpower are two common terms which mean the same phenomenon viewed differently. T. W. Schultz uses the term human capital for high level manpower.[8] Expenditure to bring out built-in potential hidden in the human stock of a nation is no more deemed as purely consumption or welfare motivated.

Three Stage Life Cycle of Human Capital

The problems of development of human capital have to be analysed from different angles as they pose multidimensional focal points. Life cycle of human capital runs through 3 stages:

Stage I — Gestation period (First and Second decades).
Stage II — Productive period (Third, Fourth and Fifth decades).
Stage III — Unproductive (Sixth decade until death) Survival period.

Stage I covers schooling, body building, and higher studies. The cost of education is generally calculated on the basis of earning foregone by the students. Attempts to include human capital as a factor of production in the quantitative analysis of the sources of economic growth scarcely qualify as cost-benefit analysis. Studies which have concentrated on costs of education including imputed earnings foregone and on those benefits of education which take the form of higher incomes might be of some use to policy makers in choosing where and how to increase expenditure on education.[9] Blaug,[10] Bowman,[11] and Weisebrod[12] have provided an account of some of the unmeasured benefits. In the Indian context, where there is so much of disguised unemployment, it is unrealistic to talk of alternative earnings foregone. The opportunity cost of students' time is zero.[13] On the contrary, in ' Kangra Tea Plantations ', child labour was found earning significant wages for leaf plucking. Dearth of child labour was attributed to the implementation of compulsory education.[14]

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[8] T. W. Schultz, 'Capital Formation by Education', *Journal of Political Economy*, December, 1965.

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Peculiarities of Human Capital

Human capital has many peculiarities which distinguish it from physical capital.

1. No two units of human capital are homogenous.
2. Agent and factor in human capital are not separable unlike those of physical capital and other production factors.
3. Human capital has longer gestation period as compared to physical investment.[15]
4. With the lapse of time and on-the-job experience human capital adds to built-in potential of human stock until the retirement age.
5. Depreciation of human capital is difficult to be rated as it rests on many factors including the factor of heredity. Dr. M. Nanjundappa treats educated people as durable productive factor and education itself as a process which adds qualities to that factor.[16]
6. The discriminating quasi rental value of human capital is attributed to the native talent and specialized skill of a personnel. Famous surgeons earn higher quasi rent as compared to marginal surgeons who are equally qualified in formal education.
7. Occupational and spatial mobility of human capital is influenced by socio-economic factors besides purely commercial considerations.
8. Human capital earns provident fund which is provided for the security of the dependents of the actual earner. Physical capital earns depreciation fund for its own replacement in full or in part after it gets worn out and incapable of rendering any service.
9. Productivity of human capital is the function of efficiency of man as well as the resourcefulness of the firm and the country where he is employed. A medical doctor earns more in U.S.A. as compared to India for similar service rendered with equal qualifications and experience.
10. Development of human capital is the precondition of the optimal utilization of improved technological physical inputs and their relationship is of a complementary nature.
11. Expenditure on human beings is non-transferable and its consumption and investment components are inseparable and it changes the economic as well as the non-economic attributes of the subject concerned.

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[15] Tawney, *Some Thoughts on the Economics of Public Education.*

[16] Dr. M. Nanjundappa, *Investment in Human Resources*, Popular Prakashan, Bombay, 1966, p. 61.

From the above analysis, it is obvious that human capital claims many social advantages over physical capital. However, it is qualified by more social ambiguities which cannot be quantified and no exact model can be framed where human capital is bound to discharge its given role like its counterpart, physical capital. Growing intersectoral economic disparities between agriculture and industrial sectors in India, is attributed to transfer of developed human capital from rural to urban areas. Farming is taken to be a degraded profession by educated persons in this country. Education, therefore, fails to play its positive role.

Productivity of Human Capital

To the economists interested in recognizing human capital as an important production factor, the concept has posed a serious problem due to the difficulty in ascertaining its economic return. Some economists have adopted the ' Cost and Benefit Analysis ' and others have tried to apply the ' Productivity Analysis ' to test its economic validity. Without taking into consideration the merits and demerits of the two principal approaches this part of the paper deals with important hypothetical issues inherent in the productivity approach.

During the annual conference of the All India Economic Association, held in 1965, it was resolved in a group discussion that there is no dearth of empirical results which have shown that the productivity has been significantly raised by augmenting the efficiency of human capital in the U.S.S.R, U.S.A, Germany, etc. Even the war hit countries with high built-in-potential hidden in their human stock have successfully rehabilitated their economies in the post-war years within a short span.

As shown in Graph I, additional productivity can be registered with a given technological level, by raising the efficiency of human capital over a period of time. Productivity curve AP in our hypothetical illustrative example represents a developing country ' A ' with low human capital–out put ratio while BP curve represents the case of a relatively developed country ' B ' where human capital has a higher rate of productivity in the base year 1930 and the coming year 1970. In 1950, productivity level of human capital in country ' B ' was at par with that of the level of country ' A ' in 1970. The economic distance at 100 productivity level therefore is 20 years between the countries ' A ' and ' B '. Here the assumption is that there occurs no significant change in the exogenous and endogenous variables in the economy of both the countries. It is inferred that never in the future would productivity level in the two countries be at par because the disparity would widen further in 1970, as shown in the Graph 1.

In Graph 2 one more factor *i.e.* the optimal productivity level has been introduced. Other things given, productivity curve AP shows its optimum point at productivity level 100 in 1955 at point 0. The same level is attained by the productivity curve BP in 1950, while its optimum point 0_1 will be attained at 145 productivity level in 1970. Then the productivity curve would decline gradually. From the above we conclude that in developing country 'A' optimality in productivity is attainted fifteen years after it has been attained in country 'B'. The difference of optimality between the two countries is 45 units as shown in Graph 2. The law of diminishing return is applicable in country 'B' after 15 years of that in country 'A'. Meanwhile if the developed country 'B' gets involved in war or in any other phenomenon which upsets its economic system, there is a possibility of the curve AP by-passing the curve BP. War normally does not wash off human skill completely in an advanced country. Even if an advanced economy is ruined by war, the recovery programme would yield higher productivity and the recovery would be made in a shorter period unlike that of developing countries. T. W. Schultz evaluating the role and place of human capital in the recovery programme of war-hit countries has pointed out that human capital has greatly contributed in the rapid economic recovery of Germany in the post-war period.[17]

W. Leontif has examined the role of human capital in raising American productivity in relation to the employment of physical capital. He has found that American Export Industries have greater labour intensity than capital intensity. He uses the term labour in the generic sense covering managerial, supervisory and technical skills.[18]

Graph 3 makes it clear that country 'A' had attained its optimum productivity level (*i.e.* 100 units) at point 0_1 in 1950; thenceforth, it has been showing a downward trend for want of adequate human capital to cope with the changed technical coefficient of production factors. Productivity curves AP and BP would intersect each other at point 0, in the year 1970. The economy of country 'B' would be reverting back to its past level of productivity at 85 units in 1970 which it had passed in 1945. Country 'A' which is populous would be gradually and regularly growing its productivity without reversal. It is thus suggestive that India should not indulge in world politics and war, steered by developed nations. She should divert her resources from unproductive channels and concentrate in the development of human resources and formation of human capital to raise its productivity without reversals and set backs. After getting self-sufficient, India could earn foreign exchange by exporting human capital to other countries.

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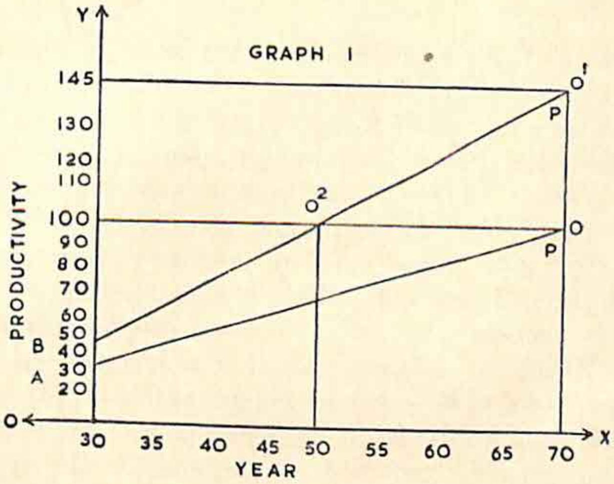
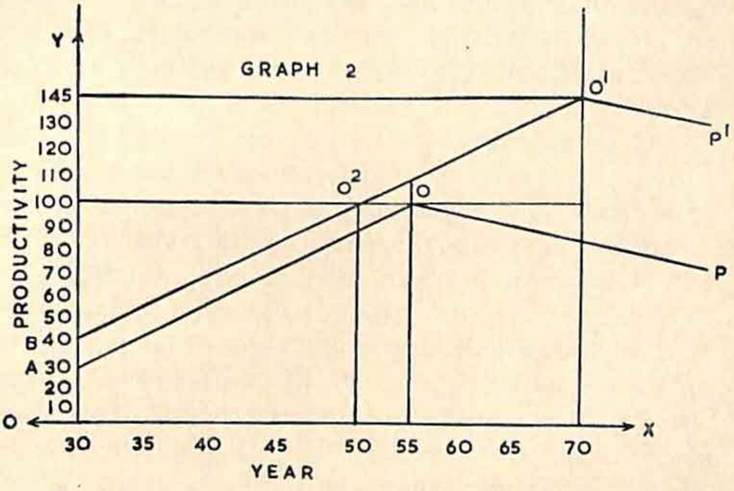
[17] T. W. Schultz, 'Investment in Human Capital', *The American Economic Review*, Vol. LI, No. 1, March 1961.

[18] W. Leontif, 'Domestic Production and Foreign Trade American Capital. Position Re-examined,' *Proceedings of the American Philosophical Society*, September 1953.


GRAPH 1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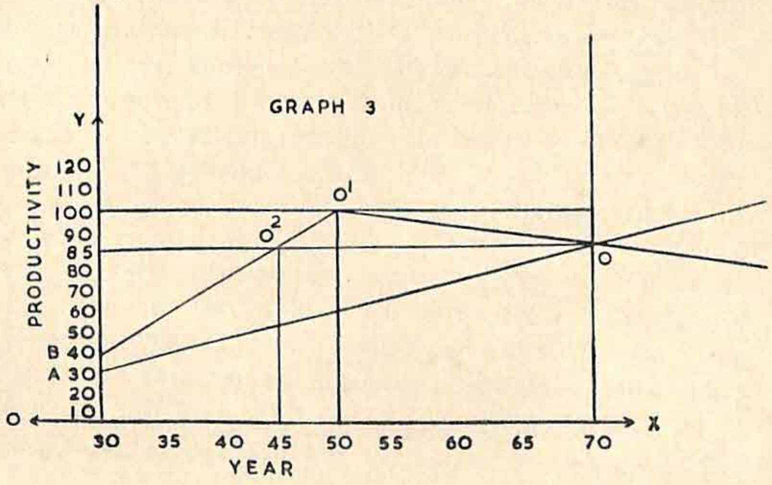
GRAPH 3

Erosion of Human Capital

The term brain-drain indicates the phenomenon of flight of manpower from an area of low productivity to that of high productivity. Erosion of human capital indicates a still worse state of affairs when the processed manpower of a developing nation comprising of scientists, engineers, professors, medical personnel and other technically trained persons voluntarily migrate to developed countries to earn higher returns. Factors responsible for the migration are—low returns to human capital, insecurity of service, promotion and placing, low social status, disguised unemployment, under employment, political and economic instability. To cite an example, migration of Indian nationals to the U.S.A. was calculated to be 4667 for the period between 1948 and 1964. The immigration Acts of the U.S.A. and U.K. provide easy accommodation to Indian labour and technicians; this enables them to make use of their own human capital with greater advantage at a higher technological level. Out of these 4667 immigrants, 1570 were naturalized during the same period *i.e.* between 1948 and 1964. In 1964, 252 Indian nationals migrated to the U.S.A. out of which 112 were professional technical workers, 78 were with no declared occupation, including children, housewives and others. Rest of the 62 persons fell in to the occupation group of managers, farm workers, officials, clerks, sales workers, foremen, craftsmen, etc.[19] This is sufficient to substantiate the above erosion phenomenon.

Due to the long gestation period (two decades), involved in the formation of human capital, advanced countries with scarce manpower have to import human capital from thickly populated countries to man the traditional plants of factories. In this respect, India is in an advantageous position as it has a large group of unemployed engineers, technologists and scientists, which can be and are being exported to U.S.A., U.K. and other countries. These advanced countries also impart higher education and training to employ them in the more sophosticated fields of industrial sectors, equipped with the latest technological discoveries. What is more needed is that India must raise its formation of human capital in two broad categories: (i) for export to other nations and (ii) for domestic employment in India itself in the projects under progress and proposal. Projections of demand for human capital by other nations can not be very precise as they tend to be more political than economic. Domestic demand for human capital must however be projected with due consideration of the direction and pattern of industrialization and mechanization of farming and allied sectors, which are adopted to achieve a balanced development of the Indian economy.

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[19] Ralph R. Ireland, 'Indian Immigration to the United States, 1901-1964, Retrospect and prospect', *Indian Journal of Economics*, Vol. XLVI, Issue No. 183, pp. 472-474, Allahabad.

Chapter Twenty-Seven

Terminalization Approach to Pre-University Education in India

B. RAMAMOORTHY and M. S. PRAKASA RAO

Groundwork of Assumptions and Postulates

The costs-receipts calculus of economists at present tends to be applied to education on the basis of three theoretical foundations—that the economic significance of education consists in its being visualized as a process of ' human capital ' formation, that the educated worker could be treated as a ' resource ' available to be allocated to subserve predetermined ends, and that education, apart from being a consumption good, forms a species of investment, ' returns ' from which are to be rationally correlated to ' costs '.

Subscribing to these theoretical foundations, *we proceed to argue in this paper for a shift of emphasis on investment to pre-university education viewed as a decisive terminal stage.* The argument is peculiarly applicable to educational programmes in developing countries, stemming as it does from their socio-economic background combined with their political commitments. The current development defined as ' educational explosion ', following in the wake of ' population explosion ' experienced by most of these countries during the 1950's and 1960's, compels *a rethinking regarding the most effective strategy of investment, by stage and sector, calculated to maximize ' returns ' from education.* While our argument is broadly relevant to many developing countries, we rely on the Indian situation for illustrative purposes.

The assumptions and postulates that condition our reasoning may now be spelt out. In the first place, the time horizon of our paper is strictly drawn at 1981, upto which point of time we do not expect demographic pressures in many developing countries to ease significantly. Secondly, we assume that the declared social goals of these countries will prevail over this period, so that the urgency to endow their newly won political freedom with an economic and welfare content will continue to influence their entire public activity. In respect to India, we postulate that the constitutional provision that ' the State shall endeavour to provide for free and compulsory education for all children upto the age of 14 years[1] ' will be progressively satisfied and that, regardless of economic consequences, the current trend towards affording universal education, freely upto the primary stage and partly freely upto the secondary stage will persist. Thirdly, we further postulate that the technique of planned economic development, in spite of its deficiencies and occasional failures, aiming at telescoping the long-drawn secular processes of industrializing and modernizing these countries within a stipulated span of time, will continue to be adopted. Especially, implementation of the development plans in India, inclusive of the Sixth Five Year Plan, 1976–81, (as indicated in the Fourth Plan document) is taken by us practically as a datum. Fourthly, we regard increasing integration of economic planning on the one hand with manpower planning and educational planning on the other, generally under government auspices, as a precondition of national development. Finally, we assume that in the developing countries, notwithstanding their previous educational philosophy and tradition, the content of education is likely to be more and more oriented towards the employment market. The radically scientific bias which the Indian Education Commission of 1964–66 proposes to impart to education at all levels symbolizes the spirit of the age that actuates administrators, planners and educationists in the countries under review.

The term 'pre-university education', used advisedly in this Paper, comprehends all those types, stages and sectors of education in India on the successful completion of which a pupil is deemed to be duly qualified to receive university education. It is visualized as a single, continuous and integrated academic process which eventually prepares the pupil to enter the labour market for employment. Disregarding the traditional conceptions that primary education is meant for the masses and secondary education for the select few, and that the former should provide undifferentiated general education and the latter diversified courses to suit the varying aptitudes and abilities of the pupils, the Indian Education Commission found it more convenient and appropriate to treat the entire pre-university period of education as one stage 'for a proper planning and development of the school curriculum'.[2] Then alone it would constitute a basic, national infrastructure of education on which the edifice of skilled manpower could be built.

Political, Social and Economic Determinants of Education

The governments of newly-independent countries are subjected to powerful pressures in the framing of their educational policy. Expansion of education in all directions, beginning with mass literacy campaigns and ending with the establishment of universities as status symbols, almost meant an expression of freedom. The Directive Principle of State Policy enshrined in Article 45 of the Indian Constitution (referred to earlier in the paper), typifies the national urge of the emerging nations for cultural fulfilment that has been denied during their long colonial rule.

'Also, the tremendous increase in the awareness of the people has created demand for rapid expansion of educational facilities'.[3] The growing hunger for education among the urban people, particularly among the middle classes, is attributed to their realization that the only worth-while legacy which they could leave to their children is a good education; and evidence of the awakening of the rural people and lower classes is found in their search for social advancement through education and government service.[4]

Another major factor that contributed to the cumulative pressure for educational expansion is the growing interdependence between economic and educational programmes. In India especially the goal of economic growth embodied in the five year development plans exerted a powerful impact on educational development, while the growing economy in its turn made increasing demands in various fields for educated and trained personnel. Indeed, the Education Commission of 1964–66 envisages an enrolment policy correlated to manpower needs for national development.[5] The statement of the Fourth Plan document is equally explicit over this issue: 'Education as an investment in human resources plays an important role among the factors which contribute to economic growth. It secures returns in the form of skilled manpower geared to the needs of development and also creates the right attitudes and climate for development'.[6]

The very process of educational expansion generates forces from within itself which give impetus for further expansion. For instance, in India the phenomenal rush for higher education is traced to the fact that secondary education is regarded now as the minimum and higher education as the optimum qualification for securing any worthwhile job.[7] Again, the absence of adequate job opportunities for young persons with lower qualifications compels them to seek secondary and university education as an alternative to enforced idleness.[7]

Inadequacy of financial resources imposes a severe limitation on the aspirations and programmes of developing countries in the sphere of education. Substantial allocations have been made by State Governments in India since independence both to establish new schools and to subsidize enrolment where merit is handicapped by poverty. Still, no matter how reasonably large financial provision might be for education, it would hardly be found adequate considering the explosive growth of population in most of the developing countries. Of course, for purposes of the time span envisaged in this paper, the generation that would be seeking various levels of pre-university education was already born during the Third Plan period, 1961–66. As Gopalaswamy observed 'if we had succeeded in reducing the birth-rate by half during the decade following independence, we would have been close to achieving the target of universal primary education in 1961 '.[8] As it is, despite vigorous efforts, by the end of the Third Five Year Plan in 1965–66 enrolment of children of the age-group 6–11 into primary education amounted to only 78·5 per cent, of the age-group 11-14 into middle stage 32·2 per cent and of the age-group 14-17 into secondary education a mere 17·8 per cent.[9] Added to this, as the 1961 Census demonstrated, the age pyramid of the Indian population has broadened at the base since 1951; and the population projection in the Third Plan document makes it clear that children in the age-group 0-14 will continue to form a little over 41 per cent of the total till 1976.[10]

Consequently, tailoring their enrolment policy to the constraint of limited resources, the Education Commission laid down the following principles to govern enrolment in India, (*a*) to provide general education of not less than seven years' duration to all children on a free and compulsory basis and to expand middle stage education on as large a scale as possible, (*b*) to provide higher secondary education to those who are willing and qualified to receive it, consistent with the demands for trained manpower and the need to maintain essential standards ; and (*c*) to emphasize the development of professional, technical and vocational education needed for the development of agriculture and industry.[11]

Expansion of Pre-University Education, 1947–66

Although achievement still falls short of the target set in the Constitution and although financial shortage operates as a distressing constraint, nevertheless the expansion of pre-university education in India must be considered to be truly remarkable. According to the *Second All India Education Survey* of 1967, between 1946–47 and 1964–65 the number of primary schools increased from 1,72,661 to 3,87,100; the number of middle schools from 12,845 to 69,474; and the number of secondary schools from 6,682 to 24,967; at the same time, enrolment in classes I to V increased from 14·11 million to 48·29 million; enrolment at the middle stage from about 1·8 million to 8·7 million; and enrolment to the secondary stage from 1·8 million to 4·5 million.[12] Taking into consideration enrolment alone as the measure of progress, it is clear that at the primary stage it increased by about 242 per cent, at the middle stage by about 378 per cent and at the secondary stage by about 314 per cent.

Table 1 exhibits data provided by the Fourth Plan document regarding the progress in enrolment revealing what might be considered to be the impact of development programmes. The figures are not necessarily identical with those given in the above paragraph, but their general import remains the same.

TABLE 1

PROGRESS IN THE NUMBER OF STUDENTS AT SCHOOLS AND COLLEGES
1950–51 TO 1965–66

(*figures in millions except at V*)

Stage and age-group	1950–51 Actuals	1955–56 Achievement	1960–61 Achievement	1965–66 Achievement	Percentage Increase of (5) over (2)
1	2	3	4	5	6
I. Primary (6-11) Classes I-V					
Enrolment	19·15	25·17	34·99	51·50	168·9
Percentage of the age-group	42·60	52·90	62·20	78·50	...
II. Middle Stage (11-14) Classes VI-VIII					
Enrolment	3·12	4·29	6·70	11·00	252·5
Percentage of the age-group	12·70	16·50	22·50	32·20	...
III. Secondary (14-17) Classes IX-XI					
Enrolment	1·22	1·88	2·96	5·24	326·9
Percentage of the age-group	5·80	7·80	11·70	17·80	...
IV. University Education (17-23) (arts, science and commerce)					
Enrolment (including intermediate)	0·30	0·52	0·73	1·10	266·7
Percentage of the age-group	0·70	1·10	1·50	1·90	...
V. Technical Education (admission capacity)					
Diploma No.	5,900	10,480	25,800	49,900	745·7
Degree No.	4,120	5,890	13,820	24,700	499·5

SOURCE: Annexure I, data rearranged: *Fourth Five Year Plan–A Draft Outline*, p. 380.

Thus, on the evidence of enrolment, the inference is warranted that the expansion achieved at the secondary stage, by 326·9 per cent, went far in advance of that at the middle stage, although only 17·8 per cent of the age-group 14-17 were covered by it. Further, with regard to university and technical education, the progress achieved was truly remarkable. It remains to be seen whether the three development plans implemented during this period created enough job opportunities to absorb this increase at secondary, university and technical levels.

However, enrolment, although directly related to the direct expenditure incurred on education, can only be a partial guide to progress in education since it conceals as much as it reveals. For instance, it fails to take into account drop-outs, wastage and stagnation which aggregatively produce a significant gap between enrolment and out-turn. Still, since we are concerned with broad magnitudes, we rely on this measuring rod, though admittedly crude.

According to the 1961 Census, 82 per cent of the population lived in the rural areas. Out of an estimated population of 494,781,200 in 1966, the *Second All India Educational Survey* found that in this year in the rural areas (excluding Naga Land, NEFA, Andaman and Nicobar Islands and Sikkim) population has been estimated at 396,580,123, forming 80 per cent of the total.[13] A meaningful assessment of educational expansion can be obtained if a rural-urban breakdown of the relevant data is presented. Data in Table 2 will be illuminating in this connection:

TABLE 2

DISTRIBUTION OF PRIMARY, MIDDLE AND SECONDARY SECTIONS BY RURAL AND URBAN SECTORS, 1965

S. No.	*Stage of education*	*Total*	*Rural Sector*	*Percentage of total*	*Urban Sector*	*Percentage of total*
0	1	2	3	4	5	6
1.	Primary	4,55,681	4,11,047	90·20	44,634	9·80
2.	Middle	96,932	76,103	78·51	20,829	21·40
3.	Secondary	26,883	16,285	60·58	10,598	39·42

SOURCE: Computed from data in *Second All India Education Survey*, pp. 24, 41, 42 and 58, National Council of Educational Research and Training, August 1967.

It is clear that at present about 40 per cent of the secondary sections are located in urban centres with the result that a substantial section of the children in rural areas not securing secondary schooling in their own habitations or near them go without it for financial reasons or are forced to commute to urban areas. Taken in conjunction with the almost total concentration of university and higher technical education in urban centres, the uneven distribution would work towards an overwhelming urban bias in education. There is ample empirical evidence to show how the urban-educated rural young person fails to integrate into the social milieu of his or her domicile. The result is a continuous aimless drift towards urban centres with the implied export of unemployment from the rural areas.

The Absorptive Capacity of the Developing Economy

To expect the implementation of development plans to function smoothly like a well-oiled engine is to court disappointment, especially under the constraints of democratic government within a federal framework and excessive dependence on foreign aid, and above all an unprecedented growth in population. Short-term imbalances in any sector might be expected. Economic planning sooner or later necessitates educational planning if only to match the out-turn of educated and trained personnel with the manpower needs of an expanding economy. If, however, the gap between the demand for, and supply of, such personnel steadily widens and persists over time, there is cause for serious concern. The capacity of the economy to absorb labour force might be far more limited than estimated; or, where education is not market-oriented, the economy might generate negligible or no demand for specific sections of manpower supplied.

For purposes of creating employment, the Planning Commission of India takes into account only the age-group 15-59. Further, according to the employment policy adumbrated in the development plans, 'expansion of employment opportunities commensurate with the increase in the labour force over the plan period is conceived as one of the principal aims of the Third Plan.'[14] However, the actual performance of the Second and the Third Plans makes it abundantly clear that it fell short of even these limited targets, so that the back-log of unemployment that eventually confronted the Fourth Plan amounted to about 9 to 10 million.[15] An analysis of the educated unemployed out of this back-log should be illuminating for purposes of ascertaining how far economic planning and educational out-turn are matched.

According to the 1961 Census the unemployed (inclusive of both persons seeking employment for the first time and those employed before but now out of employment and seeking work) numbered 1,089,681 in urban areas and 570,061 (excluding the unemployed from NEFA) in rural areas.[16] Admittedly these figures represent a gross undercount.

Still, a breakdown of these aggregates into certain components as given in Table 3, can be revealing:

TABLE 3

DISTRIBUTION OF THE UNEMPLOYED BY SPECIFIC COMPONENTS AND BY RURAL AND URBAN SECTORS, 1961

		Urban		*Rural*
S. No.	*Components by educational level*	*Persons seeking employment for the first time*	*Persons employed before but now out of employment seeking work*	*Total unemployed*
0	1	2	3	4
1.	Total unemployed	790,356*	299,322*	570,061
2.	Matriculation or higher secondary	156,231	35,042	152,441†
3.	University degree or post-graduate degree other than technical degree	21,780	5,011	
4.	Technical or diploma equal to degree or post-graduate degree	3,523	727	
5.	Technical diploma not equal to degree	2,450	554	

*Components do not add up to the total.

†Matriculation and above.

SOURCE: Data rearranged from 1961, *Census of India*, Vol. I, India Part II-B (iii) General Economic Tables—pp. 540, 542 and 582-3.

Thus, it is painfully clear that in 1961, at the end of a decade of planned development, if we take into account both the urban and rural sectors and the new entrants into the labour force and the unemployed, *the matriculate unemployed formed as much as 20·7 per cent*, and that they were more or less evenly distributed between the two sectors. *Degree holders at the university level formed 20·8 per cent of unemployed new entrants into the labour force.* Less disturbing is the situation with regard to the technical personnel both at the degree and diploma levels. Of the new entrants, degreeholders formed 0·4 per cent, and diploma holders formed 0·3 per cent. Nevertheless, even in their case, it is noteworthy that hundreds at both these levels remained without employment and were seeking work.

Information furnished by the National Sample Survey in their Fourteenth Round of July 1958 to June 1959 regarding educated unemployed is equally impressive, while methodologically it is more satisfying. According to this Survey, in the urban areas, out of the total of persons with general education, gainfully employed persons qualified upto matric and above amounted to 3·70 per cent while the unemployed similarly qualified amounted to 0·22 per cent.[17] Further, out of the total unemployed persons with general education combined with technical or professional qualification, the unemployed at the matriculation level amounted to 1·37 per cent and at the graduate level to 0·11 per cent.[18] In the rural areas out of the total of persons with general education, unemployed persons with qualification upto matriculation and above amounted to 2 per cent.[19]

Employment exchanges provide ample evidence of the wide-spread nature of unemployment among young persons with education upto higher secondary stage or matriculation. As the Third Five Year Plan states ' A significant proportion of educated persons registered as unemployed have had education ranging from the middle courses in schools to the first or second year at college '.[20] The Education Commission naturally drew attention to the mounting gravity of this situation by pointing out ' how increasing unemployment among matriculates synchronizing with mounting pressures for expansion of education at precisely this stage during the next two decades might accentuate deterioration in standards and render the problem of educated unemployed extremely serious.'[21]

Unemployment in a critical sector has recently been dramatized by the discharge of hundreds of engineers on the completion of a particular stage of the Nagarjuna Sagar Dam in Andhra Pradesh. In fact, several States have been reporting surpluses of engineers. An unemployed engineer indicates unmistakably some gross misallocation of resources in the training of costly skills, from the national point of view. It may be remembered that the current recession is particularly noticeable among the engineering industries. The net result is a grave doubt cast on the capacity of the Indian economy to absorb *the additional requirements* in engineering and technology for graduates estimated at 5,300 and diploma holders estimated at 18,100 by the end of the Fourth Plan.[22]

Review of the Pattern of Investment on Education

Thus, the unemployment situation is fast assuming the dimensions of a crisis. On the one hand, forces compelling expansion of education at all levels, especially at the secondary stage, have gathered momentum; as already stated the expansion of the economy has not kept pace so as to absorb the out-turn from schools and colleges. Perhaps, given the political and social objectives of the country, neither arresting nor reversing the process of educational expansion would be desirable or practicable. At the same time, if the human resources built up by means of heavy investment remain unutilized or under-utilized at an increasing rate, the self-same political and social objectives might ultimately be defeated.

A heroic remedy sometimes suggested as a way out of this painful dilemma confronting the economists as well as the educationists in India consists in a drastic reduction in enrolment and a ruthless application of the principle of rationing to education at all levels. Such a remedy, apart from being a counsel of despair, might prove worse than the disease. A way out of the dilemma could possibly be found in a judicious application of a combination of measures including, among others, a radical re-alignment of the pattern of investment on education for the production of skills commanding an unfailing demand in the employment market, reinforced by the application of the principle of suitability and selectivity to enrolment at the secondary stage and the imposition of severe restriction on admissions into non-technical non-professional and general education courses at the university level.[22a]

However, an analysis of the nature and magnitude of educated unemployment is necessary as a preliminary to the devising of appropriate measures for the full utilization of available human capital and for investment in building up such human resources in future as are immediately allocable for national development. And that, incidentally, leads to an appraisal whether the costs at present incurred on education at various levels and sectors and types are justified by receipts.

According to the Fourth Plan document, between 1951 and 1961, the labour force in India increased by over 21 million (presumably of the age-group 15–59); and during the First and Second Plan periods employment was provided to only 17 million; again over the Third Plan period the labour force increased by 17 million, but only 14·5 million were absorbed into employment; thus, the Fourth Plan has to reckon with a back-log of 10 million unemployed besides 23 million new entrants into the labour force; but the additional employment content of the Fourth Plan is estimated at 19 million, so that a gap in unemployment of 4 million or more is likely to remain.[23] Here is a clear demonstration that the development programme holds a severely limited employment content, inadequate even to absorb the current increase in the labour force. The back-log of unemployed may safely be assumed to consist of both the educated and uneducated; and the uneducated segment of them usually get absorbed into some traditional activity thereby swelling the ranks of the under-employed.

The educated segment of the back-log of unemployed constitutes the hard core of the problem. The direct expenditure incurred on their education represents a money cost to the nation that goes unmatched by returns. This is the context in which it is legitimate to argue for a pattern of investment for the out-turn of such skilled and trained personnel as are not likely to be abjectly dependent on wage employment but are capable of self-employment with reasonable income.

Data are presented in Table 4 to indicate the relative amounts of direct expenditure incurred at certain standardized levels and stages of education in order to facilitate comparison.

TABLE 4

ESTIMATED DIRECT EDUCATIONAL EXPENDITURE RATES PER PUPIL FOR STANDARDIZED STAGES AND LEVELS OF EDUCATION, 1961–62

Stage/level	*Expenditure in Rs. (current prices)*
1	2
A. General School Education Stages :	
Stage O	28·0
Stage I	28·0
Stage II	55·0
Stage III	134·0
B. General College/University Education Stages :	
Stage IV-A	290·0
Stage IV-B	290·8
Stage V	581·6
Stage VI	1308·6
C. Employment Preparatory Education :	
Vocational level	271·0
Sub-Professional level	542·0
Professional level	1084·0

SOURCE: I.A.M.R. Working Paper No. 8/1965—'National Educational System—Review of Growth, Part III—'*Educational Expenditure*'—Table IV, p. 21.

It is clear that the costs implicit in the unemployment of pupils vary with stages and levels of education. The wastage of investment on educated persons, if unemployed, at the university higher stages and professional levels is about 10 times heavier than that at the school higher stages. An idea of the pattern of investment on education in 1961–62 can be inferred from the fact that direct educational expenditure amounted to Rs. 1,687 lakhs on Universities, to Rs. 2,339 lakhs on Arts and Science Colleges, to Rs. 1,865 lakhs on Colleges for Professional and Technical Education, to Rs. 1,282 lakhs on Vocational and Technical Schools, to Rs. 3,338 lakhs on Higher Secondary Schools and to Rs. 4,569 lakhs on High Schools.[24] When the out-turn from these institutions is juxtaposed to these figures, the relatively heavier costs of university, collegiate and technical education becomes clear; which makes it imperative that the products of these institutions shall not remain unutilized or underutilized. It is true that in 1961–62, judged by the standards of advanced countries, the per capita educational expenditure in India, both direct and indirect, of only Rs. 8·96 (at current prices) may be pronounced as little; but that ' little ' is our all.[25]

If unemployment of human resources is unwarranted, their misallocation is equally unjustified, considering the relative scarcity and consequent high value of these resources. A recent Survey of Utilization of Educated Persons in Maharashtra during the Third Plan period shows that while unemployment among educated persons amounted to 8·9 per cent, its incidence among graduates in Arts, Commerce and Law stood as high as 12·2 per cent; the 2·3 per cent unemployment among engineers (both degree and diploma holders) is regarded mostly as frictional; although the impact of unemployment among Science graduates was low, viz. 2·57 per cent, still their employment in occupations like clerks, punch-card operators and accountants indicates uneconomic use of resources; and a similar wasteful use of qualifications is indicated by the employment of some Arts graduates as ticket collectors and of Law graduates as clerks.[25a]

Apart from the money costs involved in the wastage of skilled and trained personnel, there are social costs which (though not quantifiable) are nevertheless important from the point of view of not only their corroding effect on the individual morale but also of their impact on the social fabric. The current widespread unrest among the student population is attributed to (among other causes) the bleak prospects of their worthwhile employment; if not contained betimes, it may very well endanger the country's social and political stability. An Arts graduate, hailing from the rural areas but being addicted to urban ways of living, finds himself a misfit in his native social order and gravitates to the cities; and, there, underemployed or unemployed, he becomes frustrated and embittered and accordingly forms the raw material which is exploited by anti-social elements. Nor is the over-emphasis on Science education justified by returns; for example, it is worthwhile enquiring into the utilization of the mass out-turn of B.Sc. graduates, barring a small percentage of them which is absorbed into M.Sc., Technical and Teaching courses.

Transformation of the Labour Force in the Traditional Sector

From the point of view of the labour force, economic development may be defined as the conversion of the mass of undifferentiated labour into skilled and committed manpower. Further, in the case of many underdeveloped countries, such development may also be conceived as the transformation of the traditional into the modern sectors. Educational and manpower planning in India might with advantage be oriented to this aspect of the development problem.

The traditional sector of the Indian economy comprises the 'industrial categories' or branches of economic activity named by the 1961 Census as 'Cultivators', 'Agricultural labourers', 'Mining, quarrying, fishing, hunting, plantations, etc.' and 'Household industry'. The 'traditionalism' of the sector arises out of its characteristics such as self-employment, production mostly for subsistence and operation of the family as the unit of labour. Under-employment is structurally rooted in this sector since the given quantum of available work gets distributed among the increasing members of the family so that the output per worker gradually declines. Finally, the inherited skills are hardly reinforced by education and training in the modern sense of the term.

Data presented in Table 5 indicate a distribution of the working force of India in 1961 by industry and incidentally the magnitude of the traditional sector:

TABLE 5

DISTRIBUTION OF WORKING FORCE BY INDUSTRY IN 1961

S. No.	*Industrial Category*	*Number of Workers in 000's*	*Workers in each category as a percentage of total working force*
0	1	2	3
1.	Cultivators	99,621	52·8
2.	Agricultural labourers	31,522	16·7
3.	Mining, quarrying, live stock, forestry, fishing, plantations, etc.	5,221	2·8
4.	Household industry	12,031	6·4
5.	Manufacturing other than household industry	7,975	4·2
6.	Construction	2,060	1·1
7.	Trade and commerce	7,654	4·0
8.	Transport, storage and commerce	3,019	1·6
9.	Other services	19,573	10·4
	Total	188,676*	100·0

*Individual category totals do not add up to the grand total due to rounding of figures.

SOURCE: Rearranged data from *Census of India 1961*, Vol. I, India, Part II-B (i), General Economic Tables, pp. 86-87.

Thus, about 78·7 per cent of the working force was employed in the traditional sector. Almost this entire section of the working force is located in the rural areas, since the traditional sector and rural sector in the Indian economy are nearly equal if not identical. Thanks to the demographic effect of the 1950's and 1960's, the strength of this traditional sector is unlikely to diminish by 1971 or even 1976. Further, as the economy finds it difficult to absorb into gainful employment the natural increase in the labour force within the modern sector, there is hardly any likelihood of any transfer of the working force from the traditional to the modern sector, upto 1976 from farm to nonfarm employment, calculated to change the relative proportions of the two sectors.

An overwhelming proportion of the working force actually materializes in the rural sector; and the traditional industries have an amazing capacity to absorb this increase in the working force into some sort of part-time employment. The increase in the working force between 1951 and 1961 (including figures for Jammu and Kashmir and age-groups 0-14 and 60 and above) amounts to 47,756,864.[26] The development programmes gave employment to only 17 million out of this vast working force; it simply means that a majority of the remainder somehow got absorbed into traditional industries, excluding of course those workers who are known to be unemployed. This situation is likely to continue upto 1976 where the planning horizon ends.

Now, it would be an interesting speculation whether the fat and bulk of the lower and middle cadres of manpower could be produced out of this vast labour force in the traditional sector by reinforcing their primitive skills by general education upto the class VIII, if not class XI, and technical training thereafter. *If industrial infrastructure including electrification, mechanized transport and industrial estates is widely spread over the rural areas, these trained and skilled workers may reasonably be assumed to prefer self-employment in their traditional industries and occupations.* The traditional sector may then be expected to be transformed by degrees, producing in the mean time a wide variety of consumption goods which the economy so sorely needs.

Terminalization of Pre-University Education

In the course of economic development, it is not the marginal conditions, but the total conditions, that change. The marginal analysis governing the allocation of resources within the framework of given resources does not apply. It is a dynamic situation in which new resources are in the making, new industries emerge and entirely new sectors develop. Allocation of resources in such a context would be based as much on economic calculations as on value judgements and acts of faith. At least during the era of industrial revolution that is now taking place, resources should be concentrated on technical, vocational and professional education; education should frankly be oriented to the employment market; and investment should be confined to the supply of educated, trained and skilled manpower directly in answer to the demands of the diversifying and expanding economy.

We, therefore, argue for a terminalization approach to secondary and higher secondary education. We further argue for its radical vocationalization and diversification. There is of course nothing new in this suggestion, excepting the undertone of urgency with which we are charging it and the demand for its effective implementation without further delay. *Our aims are clear: increasing the productivity of the vast working force engaged in the traditional sector, and preventing wasteful investment on higher, especially university, education for which there is no economic demand.*

The first Five Year Plan document summing up the needs of the situation as it then obtained called for (*a*) an expansion of remodelled secondary education and technical and vocational education and (*b*) consolidation of existing secondary and university education and the devising of a system of higher education suited to the needs of the rural areas.[27] The Secondary Education Commission of 1952–53 included in the three major aims of secondary education ' the improvement of their (students') practical and vocational efficiency so that they may play their part in building up the economic prosperity of their country '.[28] They actually recommended, with this end in view, the introduction of a Higher Secondary stage of 4 years, conversion of high schools into multi-purpose schools and the provision of special facilities for agricultural education in rural schools.[29] The Education Commission of 1964–66 stated the same objective in possibly more explicit (and in fact quantitative) terms: ' it is essential to vocationalize secondary education and to work towards a target wherein about 20 per cent of the enrolments at the lower secondary stage and about 50 per cent of those at the higher secondary stage would be in vocational education.'[30]

The first Five Year Plan document noted the top-heavy structure of the educational system. ' Although provision at the secondary stage is properly proportioned to that at the primary stage, that at the university stage is larger than the base structure can profitably support.'[31] And yet, universities, excluding institutions deemed to be universities and institutions of national importance, proliferated during the fifteen year period, 1950–51 to 1965–66, from 27 to 65; and enrolment in university teaching departments increased from 31,231 to 1,00,000 (estimated).[32] There is no reason to believe that the investment pattern has been so changed that more appropriate proportions of expenditure on the various levels and sectors of education are now being devoted (vide data in Table 6).

TABLE 6

PERCENTAGE DISTRIBUTION OF EDUCATIONAL EXPENDITURE IN THE FIVE YEAR PLANS BY LEVEL AND TYPE

S. No.	*Sub-head*	*First Plan*	*Second Plan*	*Third Plan*	*Fourth Plan*
0	1	2	3	4	5
1.	Elementary Education	55·1	28·9	37·3	26·6
2.	Secondary Education	13·1	16·7	15·8	20·1
3.	University Education	8·8	18·6	10·5	14·5
4.	Technical Education	13·7	15·6	25·4	20·9

SOURCE: *Third Five Year Plan document*, pp. 577 *and* 607 and *Fourth Five Year Plan—Draft Outline document*, p. 325; and *Second Five Year Plan document*, p. 500. (derived percentages).

In the investment pattern relating to the Third Plan the schedule of priorities seem to be better reflected than in that related to the Fourth Plan. Although in absolute terms the allocation for technical education increased from Rs. 142 crores in the Third Plan to Rs. 253 crores in the Fourth Plan still, in proportionate terms it fell from 25·4 per cent to 20·9 per cent. This scaling down of investment in this vital sector is of doubtful wisdom. Similarly, the increase in allocation to university education in both absolute and proportionate terms between the Third and Fourth Plans is difficult to be defended in the context of our argument. The redeeming feature, however, seems to be the increase in the allocation devoted to secondary education in both absolute and proportionate terms.

It is a matter for gratification to note that the Fourth Plan document shows sufficient awareness of the crucial importance of the secondary education. It visualizes that ' efforts will be made to re-orient our secondary education and devise a system that will prevent the current rush to the universities and, at the same time, give to the secondary school leavers a training which has an employment value and make them productive workers when they go out into the world '.[33] Towards this end we suggest a two-pronged drive, one dealing with terminalization and the other with vocationalization:

a. Complete the process of converting high schools into higher secondary schools; strengthen the existing multi-purpose schools; and extensively diversify the curriculum of secondary education. The aim is to make higher secondary education truly terminal, and a preparation for life in itself, apart from being a prerequisite to entry into professional and technical courses.

b. Attach vocational guidance bureaux to higher secondary schools. Such guidance and counselling should be available to a student on the threshold of choosing a career, not after he gets admission into a college of general education or an institution of professional or technical education by which time guidance would have come too late and in any case the area of options open to the student would be pretty limited. Further, if these guidance bureaux are attached to schools in rural areas, timely counselling might well be decisive in checking the drift to the towns and conserve educated leadership for the rural areas.

c. Correct the mal-distribution of high and higher secondary schools as between rural and urban areas; in any event, as the programme of completing the provision of universal, compulsory and free primary education gets into full swing, to absorb the pupils from the resulting feeder schools, establishment of a wide net work of high schools in the towns on the rural periphery would become necessary.

d. Impart a strong rural, in fact agricultural bias to curricula upto the class VIII in these schools, since by and large they will have to cater to the needs of pupils coming from agricultural families.

Increase the number of agricultural, technical and vocational schools located in rural areas; establish a large network of school-cum-workshops for the training of artisans in traditional industries; expand and strengthen existing rural institutes and rural universities. Caution must however, be sounded against creating the impression that the students turned out of these institutions are being condemned to remain in backward areas and to accept low-paid employment. Nothing should prevent an aspiring student, with real ability and merit, from reaching out to university education and higher echelons of employment. The aim of this educational reconstruction is to ensure reasonably remunerative employment as near to the rural student's habitat as possible and to prevent export of unemployment to the urban areas.

To absorb the middle level personnel turned out of these institutions into gainful employment, a simultaneous programme of industrial opportunities has to be designed. The major components of the programme, suggested here, deserve immediate attention: complete the process of rural electrification; complete the establishment of a large network of industrial estates in towns on the periphery of rural areas; steer the location of large industrial establishments into rural centres so that around them small industries of an ancillary nature can spring up and multiply; extend the loan facilities offered by the State Bank of India to small industries located in villages.

It would be a substantial gain to the rural community, in addition to at least partly solving the problem of their under-employment, if the younger members from families engaged in a variety of traditional household industries take advantage of these educational facilities. If after undergoing technical courses in them, these household industrialists are re-absorbed into their traditional occupations, not only are they likely to improve technically their trades, but they might make their self-employment more remunerative and gainful. Care should be taken to see that education and training in these institutions do not undermine the incentive to self-employment and generate a wholesale preference for wage-paid employment in possibly urban centres.

If vigorous and sustained action on the lines suggested is undertaken, the problem of educated unemployment may not get out of control, educational and economic planning will be coordinated, pre-university education is likely to be fructified by gainful employment and wasteful investment in higher education will be minimized. Then alone will manpower in India cease to be a mere phrase and start functioning as a prime mover of development.

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[9] *Fourth Five Year Plan—A Draft Outline, op. cit.*, p. 328.

[10] *Third Five Year Plan*, Government of India, Appendix C, p. 751.

[11] *Report of The Education Commission, op. cit.*, p. 89.

[12] *Second All India Educational Survey, op. cit.*, pp. 6-7.

[13] *Ibid.*, p. 5.

[14] *Third Five Year Plan, op. cit.*, p. 154.

[15] *Fourth Five Year Plan*, Draft, *op. cit.*, p. 106.

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[17] *The National Sample Survey*, 14th Round, July 1958-June 1959, No. 83, Tables with Notes on Employment and Unemployment in Urban Areas, p. 64.

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[19] *The National Sample Survey*, 14th Round No. 100, Tables with Notes on Rural Employment and Unemployment, p. 76.

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[21] *Report of the Education Commission, op. cit.*, p. 166.

[22] *Fourth Five Year Plan* (Draft), *op. cit.*, p. 320.

[22a] *Report of the Education Commission, op. cit.*, pp. 90-91 passim.

[23] *Fourth Five Year Plan* (Draft), *op. cit.*, p. 108.

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[25] *Ibid*, p. 18, Table I.

[25a] ‘*Government of Maharashtra, Survey of the Utilization of Educated Persons in Maharashtra during the Third Plan Period*,’ Manpower Journal, Vol. III, No. 1, April-June, 1967, pp. 114-117, passim.

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[33] Fourth Five Year Plan, Draft, *op. cit.*, p. 315.

Chapter Twenty-Eight

Investment Strategies for the Crucial Sectors in the Indian Educational System

D. A. DABHOLKAR

Educational effort in India today has a large social hunger component. This hunger arises partly out of a desire for higher social status and partly out of a desire to attain a higher level of economic well-being. In a traditional society like ours, social status and economic status may not always run parallel. But in due course as in other societies in Indian society also education will be sought more and more for the opportunity it provides to improve one's economic status.

As this happens the social hunger component of educational effort will get diminished. From the investment point of view this will have an important significance because the demand for education will then become more directly related to the economic opportunities which accompany each type and level of education. That will be the first opportunity to relate education to production and to emphasize quality rather than quantity.

Perhaps the most practicable way to achieve this at an early stage will be to make recruitment for most of the government services independent of degree qualifications. This recruitment would be made on the basis of open competitive examination, with reservation etc. for backward classes, and to insist on rigorous departmental training after the recruitment has been made. This will reduce the pressure on universities, and also enable the departments to train these recruits more fully in relation to their specific jobs. If we keep the channels for further higher education open through evening classes and correspondence courses, there need be very little feeling of disappointment. In the case of jobs for which a degree qualification is a basic necessity even for an intensive departmental training we will of course have to insist on that qualification. But on careful examination it will be possible to narrow down and delimit the number of such jobs.

This will reduce the pressure on ' general ' expenditure on education and education, where it is imparted for specific skills, will get directly related to increased productivity.

The laying down of definite investment priorities and determining the exact magnitudes of effort, is, however, a very difficult task. The science of the measurement of costs, productivity and efficiency of education is still in its infancy. Statistical definitions such as we may arrive at in this or such similar seminars will help us to carry on a more and more meaningful dialogue but all that framework will not at any stage enable us to do away completely with the trained hunch of an educationist and a planner—and for all we know the most trained hunches may go very much astray if the situation takes an unpredictable abrupt turn. Planning and management of economies are removing a great degree of uncertainty in this respect but even then there is the impact of uncertain international politics on international and national economies. In a country like India which has now reached the stage of planning and management of economy where we can predict within a reasonable margin the manpower requirements so as to enable us to adjust our training programmes accordingly. Utmost effort must be made to achieve this at the higher levels of technical education where training is so costly and failures become so glaring. (The present unemployment of trained engineers is an illustration of this.) If we are to achieve efficient utilization of the limited resources available all our programmes of higher education must get related to worthwhile projections of future manpower needs. Otherwise it merely becomes a policy of spending as much as you can and hoping that everything will turn out for the best.

Investment strategies will, of course, be related to the availability of resources. It is possible to augment these resources as is obvious from the fact that all possible sources of government revenue are not at present being fully tapped, as also from the fact that the proportion of expenditure on education to total revenue varies from State to State. This indicates the possibility of increasing the amount of revenue available for expenditure on education. But the other indirect way of augmentation of revenues is not being fully investigated. It is the way of economizing on present expenditure in such a manner as not to adversely affect the efficiency of education. This involves what the Education Commission has aptly termed 'Expenditure in Thought'. This cannot mean just spinning out theories out of wishful thinking but would require rigorous experimentation. Russians have been doing it in their educational system at all levels and especially at the level of compulsory education all these years. An effective innovation there can mean a very large saving of resources. Such experimentation and study would effectively bring about a reduction in expenditure for the present level of standards or would else help us to further improve the standards. This would involve giving a thought to improvement of educational administration reframing of courses and curricula, adoption of more effective teaching methods, examination reform and textbook improvement. As things are at present it is an easy guess that the margin for such improvement and economization is fairly large.

In addition to the above the areas where concentrated doses are likely to yield crucial yields and are likely to enable us to attain critical temperatures or pressures for a real breakthrough are as under:

i. Literacy drive among the male illiterates in the age-group 15 to 25.

ii. Preparation of textbooks and translated works in the regional languages within a period of ten years. I am rather sceptical about a five-year target but see no reason why the whole programme cannot be effectively implemented in a period of ten years. If we had started it seriously immediately after attaining independence the programme would have been completed more than a decade ago and a great amount wastage, stagnation and lowering of standards could have been avoided. However, the mere spending of large amounts of money will not enable us to solve the problem and a great amount of expenditure of thought will be necessary.

iii. Programme of teacher education at all levels. The bane of our education during the last two decades has been that we have succeeded in developing almost a built-in mechanism for a progressive lowering down of standards. An inadequate teaching system trains inadequate scholars some of whom become the teachers of the next generation and the progressive deterioration proceeds further. It proceeds with cumulative momentum from generation to generation. The only way to avoid this predicament under the present circumstances is to insist on rigorous training of teacher-trainees not only in the teaching methods but in the advanced learning of their own subjects. This alone will enable us to maintain proper standards when our reorganized educational system sends out batches of properly trained students.

iv. Development of centres of advanced study and clusters of such centres. These centres will serve as 'islands of excellence' and will promote a spirit of emulation. Since these centres are likely to be distributed all over the country this atmosphere will pervade the entire nation.

v. Agricultural research and education. The importance of this sector is obvious.[1]

vi. How an entire programme needs and can get reorientation is illustrated by our experience with the compulsory N.C.C. training and the attempt to introduce Social Service for university youth completely or partly in lieu of N.C.C. This is again a case where well-directed expenditure can give important strategic results but where again it is important to remember that mere provision of funds does not give the necessary solution unless it is accompanied by careful thinking and planning.[2]

vii. Last but not least, a large amount of work needs to be done on some concrete issues about which there has been a vague accumulation of opinion, without verification of facts. I will take only two instances by way of illustration. There is a feeling that it would be possible to economize on the expenditure on building structures by having cheaper structures. The point to examine would be how much difference in cost does it really make; and are cheaper structures really cheap in the long run? Similarly our thinking on the size of the collegiate institution has vascillated between small numbers for quality administration and large numbers for low average cost of education. Such issues require a detailed study for full clarification and clear guidance. Any amount of experimentation and research would be worthwhile. If we can effectively economize even ten per cent on our building structures it will mean quite a huge amount of saving for the whole country. Such concrete study, experimentation and research are called for in a large number of what might be superficially felt to be miscellaneous items of income and expenditure.

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[1] The present author's article entitled 'Education and Productivity in Agriculture', *The Education Quarterly*, July, 1967.

[2] Some aspects of this problem have been discussed by the present author in his, article 'Social Service for University youth: A Tentative Frame-work' in the of *The Education Quarterly*, April, 1967.

Chapter Twenty-Nine

The Economics of Correspondence Course For Higher Education

P. C. MALHOTRA

In considering economics of education the following views of John Vaizey deserve to be given due weight in the zeal for educational expansion.

" I am more agnostic on the matter of the contribution of education to economic growth than a number of converts to the cause. I am doubtful whether, in the long run, the concept of education as an ' investment ' will prove much of a guide on what ' ought ' to be spent on education."[1] Further, outlays on education are likely to be fruitful only when made in conjunction with other outlays such as expenditure on housing, health and other social services. There is a tendency to consider expenditure on education in isolation with other concomitant or imputed outlays with the result that expenditure on education does not give required returns and proves wasteful. Such an attitude which is a common experience in developing countries gives an incomplete and even false idea of the costs of education. Thus expenditure on education tends to be pushed up on sentimental or political grounds.

The internal logistics of education (*viz.* the decision to develop one part of education entails consequential changes at all levels of the education system) is important while considering the economics of higher education. Therefore, any projected expansion of higher education leads to a greater total involvement of funds on education.

A further difficulty in examining the costs of education is that the objectives in education are multi-dimensional and there is a wide divergence between private and social goals. ' A parent may finance the education of his child out of a desire to increase his child's income-earning potential, or to give him a better opportunity for attaining a status and esteem in the society, or to indulge his love of knowledge for its own sake. In the newer countries, education may indeed open the door to power and influence as well as to national well-being. The parent has to make up his mind about how much to devote to the education of his children in the face of other claims on his resources.'[2]

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[1] John Vaizey, 'Criteria for Public Expenditure on Education', p. 457 in the *Economics of Education* (Ed.) E.A.G. Robinson and J. E. Vaizey.

Expenditure on education in a nation has eventually to be related to nation's manpower requirements if wastes of mis-direction or of ' over-education ' have to be avoided.

In considering the costing of human resource development the opportunity cost concept (*viz.* in choosing a commodity, service or activity which the individual or group or society gives up) has been made use of. Mary Jean Bowman[3] has suggested these multi-dimensional aspects of this concept.

Who bears the cost *i.e.* whose foregone alternatives are being examined? This may be a student or his family, it may be a business man investing in training or a Government—local, provincial or national. It may be society as a whole.

There is confusion between ' what is put in ' as opposed to ' what is foregone ', or opportunity costs.

Further, the opportunity cost theory assumes full employment which seldom prevails.

Another point worth paying attention to in educational policy is that foreign standards of education have been the cause of much mis-directed expenditure. For example, the secondary and higher education system in India unconsciously represents the ideals of a largely urban group and does not meet the need of large groups of population in the country.

The Dimensions of the Educational Problem

Since Independence, there has been a marked increase in the number of the Indian Universities, Colleges and Institutions of Higher Education. The number of universities increased from 27 in 1950–51 to about 60 at the end of the Third Plan: the number of colleges went up to a little over 1,100 at the close of the Third Plan from 772 in 1955–56. The University and Collegiate enrolment was 7 lakhs in 1960–61, touched 11 lakhs and 10 thousand in 1965–66 and it is expected to reach 16 lakhs by 1970–71.

To cope with the above demand for higher education, the Third Five-Year Plan started the scheme of ' Evening Colleges and Correspondence Courses '. It was proposed to cover 20,000 students under correspondence courses and 40,000 under evening colleges.

The Fourth Five-Year Plan has paid attention to consolidation and quality in higher education. No new universities are contemplated during the Fourth Plan period. Instead, university centres for post-graduate studies will be set-up, each embedded in a complex of colleges with a large enrolment. For raising or even maintaining quality in higher education, there has to be limitation in enrolment in regular colleges governed by suspension of starting of new universities and colleges. This would be attempted by raising the qualification for admission, arranging correspondence courses, multiplying terminal courses at the secondary stage, and by 'discouraging the opening of sub-standard affiliated colleges'.

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[2] P. N. C. Okigbo, 'Criteria for Public Expenditure on Education', p. 480 in the *Economics of Education*, Edited by E. A. G. Robinson and J. E. Vaizey.

[3] Mary Jean Bowman. 'The Costing of Human Resource Development', *Economics of Education* (Ed.) E. A. G. Robinson and J. E. Vaizey.

In the Fourth Plan the additional requirements of teachers are 779,000 for the elementary stage and 209,000 for the secondary stage. As the training institutions can not cope with this task, the Fourth Plan provides for Correspondence Course for 140,000 elementary teachers and 17,660 secondary teachers. Under University Education, 50,000 students are proposed to be educated through Correspondence Courses.

The Economics of Correspondence Courses for Higher Education

Lord Robbins is reported to have said that if it were a choice between more education and less wealth or less education and more wealth, he should not always regard the latter as the more desirable. But in the case of poor countries it is a case of more education and less of equally essential things or service such as nourishment, housing, health facilities, etc. Hence the economics of education becomes a matter of equal importance as education itself. In the field of higher education, for a poor country, education as an investment is of supreme importance.

Higher education is the more costly of the other two tiers of education *viz.* secondary and primary. Higher Education covers under-graduate, post-graduate, science and vocational studies. At the under-graduate level, the cost per student will be Rs. 733 for about 40 per cent of the enrolment (in arts and commerce course) and Rs. 1,500 for 60 per cent of the enrolment (in quality institutions in arts and commerce and in science and vocational course) in 1975–76. The total expenditure on higher education in 1975–76 estimated by the Education Commission (1964–66) is Rs. 4,222 million as against Rs. 1,954 million in 1965–66. Total national income per capita in 1975–76 is assumed to be Rs. 597 as against Rs. 325·7 in 1960–61 and Rs. 424·4 estimated for 1965–66. Taking into account the set-back that the growth of India's national income has received in the Third Plan, the assumption of per capita income in 1975–76 appears to be an unrealistic estimate. The cost of higher education may itself become inhibitive to un-regulated enrolment of numbers. Since on account of popular pressure it will be difficult to control enrolment to the facilities available for higher education, diluting standards and maintaining expenditure per student at low levels will provide an easy escape valve. In the words of Lord Robbins there could be nothing more disastrous for our intellectual future than that the quest for equality of opportunity should in any way impede the quest for intellectual excellence. The special responsibilities that are placed on those privileged to receive higher education make it incumbent on society to see that 'quality' of this education does not suffer.

As it will not be easy to arrest the total enrolment in higher education to the availability of funds required for optimum standard facilities and equipment, other problems also arise in the situation. A few of these problems are relating the output of educational institutions to forecasts of manpower needs, improving organization and administration in the public and private sectors to ensure that every educated person is fully and properly utilized, reducing unemployment among the educated, increasing the participation rates among the educated persons, revising the present policies that are based on 'over education' *e.g.* educating an engineer and using him for jobs which can really be done by technicians.

A serious attempt has, therefore, to be made to expand part-time and correspondence course education to cope with educational demands for higher education in the steel frame of hard finance. And all those who clamour for higher education as a matter of democratic right have to be informed in the words of Milton that 'Ease and leisure is given thee for thy retired thoughts out of other man's sweat'. Waste in higher education is exploitation (socialists' abuse for capitalists) of the society by the privileged population enjoying benefits of a higher education. This is not to be permitted while providing opportunities for higher education suited to different categories of requirements. In a poor country the 'opportunity costs' of higher education *viz.* costs equivalent of the foregone income which would have been earned by the students if they had engaged themselves in some direct or indirect productive activity instead of attending the course, become an important factor in the situation. At the same time, if investment in higher education were seriously contracted, there would be danger of a loss to the economy far greater than the measurable loss of the sum of the individual investments concerned.[4] But the connection between higher education and individual earning power can be over-stressed. Not all forms of higher education produce a large earnings differential and, as higher education spreads, such differential may tend to diminish. The social advantages of investment in higher education may easily exceed the commercial return.[5] At the same time there is much of practical wisdom for educational policy for developing countries in the following words of S. G. Strumilin. 'Any amount of education may be extremely desirable and useful for an individual worker if it is free. But the State which has to pay for this education wants to know whether all amounts of education are equally useful in raising the country's productivity. If all amounts are not equally useful, what is the most profitable length of education for each worker and how much should be spent on it in order to spend the national revenue in the way most likely to increase it in the future '.[6]

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[4] *Committee on Higher Education*, p. 205, London, H. M. S. O.

[5] *Ibid*, p. 211.

Experience of Other Countries

Correspondence or home-study course is a well tried and tested technique of taking education to millions who depend upon their own effort to study. The experience of correspondence courses in the U.S.A., Sweden, the U.S.S.R., Japan, Australia and Britain has tested the usefulness of correspondence course. In Britain 40 per cent of students take part-time courses or private study. In Britain technical education has made full use of part-time courses. In the United States full time study is the fashion (although very often full time students supplement their incomes by spare time work), only about 15 per cent take part-time courses. In the U.S.S.R. only 50 per cent of the students are full time.

The Financial Aspect

The total outlay on education in the Fourth Plan was Rs. 1,210 crores, which was 20 per cent more than the expenditure in all the three Plans put together and is double the expenditure in the Third Plan. In view of a total outlay of about Rs. 200 crores in each of the first two years of the Fourth Plan, an *ipso facto* curtailment of outlay for education has been necessitated. The importance of educating through evening colleges and correspondence courses is, therefore, heightened under this new situation as these are economical methods of meeting the demand for education.

According to an estimate the total cost of providing Degree Courses (Arts and Commerce) through correspondence for 20,000 candidates (spread over five years course—the regular course being 3 years, that for evening college being 4 years) was put at Rs. 30 lakhs. For provision of 50,000 students, which is the target of Fourth Plan, the estimated cost should, therefore, be 75 lakhs. This works out at Rs. 150 per candidate for correspondence course. Obviously when economy is forced in a particular situation formal expansion of education may wait and the economical methods of evening colleges and correspondence courses can be intensified as methods of improvization.

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[6] '*The Economic Significance of National Education*', S. G. Strumilin, p. 290 in the *Economics of Education* (Ed.) E. A. G. Robinson and J. E. Vaizey.

The Technique of Correspondence Course

According to the Report of the Education Commission (1964–66) experience abroad and experiments in India have shown results which, on balance, tend to strengthen the case for correspondence education. Further 'correspondence courses should not mean mere exchange of written instructions and exercises'. One essential aspect of the method is that the teachers and the taught meet occasionally even if it be for a brief while and participate in specially devised programmes which include lectures, seminars and group discussions.

'Correspondence course students living in a locality and interested in common subjects can form self-study groups and help one another. It is essential that they should be given the status of recognised students, and where possible, they should be attached to some colleges and allowed benefit of the use of the library and such other amenities as seeing educational films, listening to recorded speeches of distinguished scholars, and attending extension lectures.'[7]

The Education Commission recommended that private candidates whether employed or not should be able to take any or all the examinations conducted by the Secondary Education Boards and Universities in the country.

Evening Colleges and Correspondence Courses for Post-graduates—The Problems

To satisfy the craze for post-graduate degrees, a number of post-graduate subjects have been started in degree colleges spread throughout the State of Madhya Pradesh. This is also the pattern throughout the country. In the first wave of expansion, degree colleges were profusely started. When this reached the near saturation point, the movement of raising these institutions to so-called post-graduate colleges began. The starting of a degree college and then raising it to a post-graduate college is merely for prestige, educational standard has been the first casualty. The limited resources of a degree college (not always fully equipped) thus get extended. Admissions are not selective. The result is poor staff, fast deterioration of the post-graduate students. It is these that man our higher secondary schools and junior and degree colleges. The consequences can easily be visualized.

Post-graduate Studies in Colleges for only Whole-time Students

It is time that admissions to post-graduate studies for whole-time students should be at properly equipped institutions and universities and university centres. Post-graduate studies should be a whole-time business (students may learn by their own efforts during spare time). Admissions should be selective based on the minimum standards kept for admission to these courses and the number of seats for which proper facilities exist.

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[7] *Education Commission Report*, p. 435.

Correspondence Courses for Part-timers

A part-timer employed or seeking employment should be permitted to appear as a private candidate. University Ordinances will have to provide for this. At present only women teachers and librarians can appear as private candidates. The duration of course for private candidates may be three years as against two years for regular students. Correspondence courses can begin looking after private candidates. These courses will be conducted by universities, university centres and well-established colleges, whose staff and library and extension course facilities can be made available to correspondence course students. They will be required to attend regular lectures and seminars at educational centres for one month in a year. The basic technique of written instructions, corrections and library consultation through post will thus be supplemented. With a mixed group of part-timers and whole timers, the lowest common multiple of teaching standard tends to prevail. Lecture time-table has to be compressed within a specified time to enable persons to attend to their office. Seminars, tutorials and library study are not possible. The necessary climate is not there even for the professedly whole-time students. Lack of time for studies for employed persons becomes the plea for indulgent judging at examination.

Rationalization of Education Expansion

Proliferation of post-graduate classes needs to be stayed. Consolidation of college education is the first step in the direction of attending to quality in higher education. Something like 'rationalization' of college education is immediately called for. Rationalization implies amalgamation, modernization and scientific management. So let this be also with higher education. Money released through rationalization can be utilized for lower echelons of education. According to a P.T.I. report the Madhya Pradesh Government is considering a proposal to close down about 50 educational institutions in the State as they are burdensome to the State Government and are functioning poorly. In fact there would be a case for immediate rationalization of the entire expenditure on education, more particularly in the field of higher education.

A National Council of Home Studies

The Education Commission (Kothari Commission) emphasized the attention that is required to be paid to adult education. It recommended that the Ministry of Education in collaboration with other Ministries should establish a National Council of Home Studies which should accredit and evaluate the various. agencies functioning in the field of adult education and in particular to advise about the areas in which different types of correspondence courses would be of benefit and to establish them or assist and advise the agencies or institutions through which these courses would be conducted.

But without waiting for the establishment of a National Council of Home Studies, correspondence courses must be taken up and the Education Ministries of the Government of India and of the States should sponsor the same.

Chapter Thirty

Investment in Education—A Point of View

P. D. HAJELA

The controversy about whether expenditure on education is or is not investment may still be unsettled, but the belief in what Professor Kindleberger and some other economists have said about the importance of education to economic development is now fairly widespread. It is estimated that for a number of countries having such divergent backgrounds as those of Chile, United Arab Republic and Ivory Coast on the one side and United States, U.S.S.R., United Kingdom, France and Denmark on the other only about 1/5th to 2/5th of the annual increment in the national product may be contributed by investment in the traditional factors of production namely, land and capital. This means that investment in non-traditional factors (and education would be, perhaps, the most important one in this group) contributes something between 3/5th to 4/5th of the additional annual flow of output in these countries. One would, therefore, not be unjustified in supposing that education, by and large, is an investment rather than consumption.

However, this can only be the beginning and not the end of the story. It could not follow from this that the larger the investment in education, the greater would be the benefit to an economy. In particular, we have to remember, what is often missed in the usual discussions on the question, that in an under-developed economy like ours, education being for development, investment in education precedes rather than synchronises with or follows from investment in the other factors of production. The situation is similar to what we experience in the demographic sphere. Measures leading to a reduction in the death rate here have produced population growth which precedes rather than synchronises with or follows from economic development. We, thus, come to have a supply of men for whom the demand has yet to be created. It is more or less the same in the sphere of education also. We educate persons for development which is not quite the same thing as educating them in order to meet the demand of development. Naturally then, we face the possibility of the supply of the educated being more than the current demand for them. We are using the term education so as to include in it both general and technical education. After all, the demands for the two varieties of education stand in some definite relationship with one another and are ultimately determined by the level and the pace of economic development. In a situation, where both kinds of education are to accelerate economic development and not to be a mere response to the current level and pace of development, a mere diversion of students from general to technical education would not, as many have suggested, be a solution to any problem. It is only where there is a dearth of the technically educated that such diversion would help. Both logically and factually, it appears that we have no such shortage in India at present.

Taking university education alone, the increase in enrolment at the under-graduate stage between 1950–51 to 1955–56 was 11,000; between 1960–61 and 1965–66 it was about 263,000. This means that during the First Five-Year Plan period, under-graduate enrolment rose by 64 per cent, during the Second Five-Year Plan period by about 40 per cent, and during the Third Five-Year Plan period by about 66 per cent.

Enrolment at the post-graduate and research stages has also been rising at a fairly rapid rate. From 18,000 in 1950–51, it rose to 27,000 in 1955–56, an increase of 50 per cent during the entire First Plan period. Between 1955–56 and 1960–61, the figures for enrolment at the post-graduate and research stages rose from 27,000 to 51,000 giving an increase of 89 per cent during the Second Plan period. In 1965–66, this enrolment was estimated to be 80,000 indicating a rise of 57 per cent during the Third Plan period.

Thus, for the First Plan period, the increase in enrolment at the under-graduate stage was a little over 12 per cent per annum, for the post-graduate and research stages 10 per cent per annum. This increase was 8 per cent per annum for the post-graduate and research enrolment during the Second Plan period. For the Third Plan period, the rate of rise of under-graduate enrolment was a little over 13 per cent and of post-graduate and research enrolment a little over 11 per cent per annum. It will be agreed that this rate of increase in university enrolment was more than the annual rate of increase of national income in all the plan periods since the First. The average annual rate of growth of national income at 1948–49 prices for the first two plans was a little over 4 per cent per annum only. For the Third Plan period, it is even lower. The fact, therefore, remains that the supply of the educated persons in India has been increasing faster than the demand, a very natural situation for an economy in which education has to expand to bring about economic development and not merely to keep pace with it.

It was necessary to make a reference to this least discussed aspect of investment in education in under-developed countries because we are often prone to build up very high hopes in regard to the productivity of this investment or which is the same thing, the benefit which we are to get as a consequence of expansion in education. If the glut in the market of educated workers is inevitable because education more or less precedes rapid economic development the cost-benefit calculus of investment in education becomes a little difficult to work out. In terms of market mechanism, the economy comes to put a low relative premium on education and students at institutions of higher learning do not have much to enthuse them. It would not be generally disputed that no amount of expenditure on teachers, buildings, books and hostels can make investment in education productive or worthwhile unless the students themselves are inclined to put in their best efforts to acquire knowledge. Unfortunately for these students, the context is such as to make a glut in the market of the educated and to make a decline in the market premium on education unavoidable.

The more will be the glut in the market, the less will be the market premium on education, the more adverse will be the incidence of the disincetive effect on the students and the less will be the benefit to the society accruing from higher education.

It is said that the Soviet economist Strumilin had estimated that in the Russian economy of his time (he was making calculations around the year 1909), primary education led to an increase of 79 per cent in the output and wages of a labourer, while secondary education led to an increase of 205 per cent; the University education, he felt, produced an increase in productivity and wages approximating 320 per cent. We are not entirely sure of the traditional investment resources of the Soviet economy at that time. But it is doubtful if in the context of India today such big increases in productivity resulting from education can be hoped for. Some data given above show that higher education in India has been expanding sufficiently fast but, thus far at any rate, we have had no reason to suppose that productivity of workers as a result of such education, has increased by 200 or 300 per cent.

The low premium on education, produced by educational glut and leading to reduced enthusiasm on the part of students, not only affects quality of the knowledge acquired; it produces social maladies like indiscipline and propensity to disrespect authority and break in law and order. The resulting cost of social instability has to be deducted from whatever immediate benefits might be flowing from investment in education. Alternatively, it has to be added to the total cost involved in that investment.

One really does not know what can be done about this matter but it is clear that until economic development has accelerated fast enough, this problem will remain. How students receiving higher education can be exhorted to apply themselves to their utmost even in the face of the bleak prospects facing them today without a change in the social order one cannot say. Until we have an order which can work out things in a manner so that the decline in the premium put on education gets halted, it would be difficult for us to get the best out of our investment in education.

Within the existing social order, the only way out of the difficulty seems to be to accelerate the pace of the growth of the economy which is the ultimate determinant of the demand for the educated. Have we not been doing that in this country all these years? We have been, but we have unfortunately concentrated more on capital formation and less on the other determinants of economic growth. Our assumption has been that provided we have raised the ratio of savings to national income which is invested, a rapid economic development will follow. But as the experience of some developed economies shows, technological change, sometimes, makes a much larger contribution to economic growth than the mere raising of the savings ratio. It has to be conceded that our emphasis on such change has been much less urgent. The maximum we have done in this direction is to borrow technological change from abroad and exploit it whereas a rapid economic development requires continuing technological revolution in the country.

Perhaps the most important single prerequisite for such revolution is research and more research in the country. It is true that even here too much investment may produce a glut but we can never assess precisely the miracles which can follow from intensive research. Once a miracle has happened, economic development may be accelerated much above our expectations and the glut in other spheres of higher education might disappear. If the total resources for education cannot expand fast enough, we would be well advised to divert resources to research at the cost of other education including literacy rather than do it the other way around.

The total expenditure per student on research institutions in the country was Rs. 9,867·5 in 1950–51 but only Rs. 7,094·0 in 1955–56. Even the 1960–61 level of this expenditure was about Rs. 716 less than in 1950–51. In 1965–66 the situation improved in financial terms in so far as this expenditure rose by about 31% above the 1960–61 level. But once we correct this increase by the upward change in the price index during the period, the improvement becomes illusory.

More or less similar is the case with the per student expenditure on universities. In 1950–51, this expenditure was about Rs. 1,570·6 only. However, in 1955–56 it was about 2·7% higher. In 1960–61, it had increased by 19% over the 1955–56 level while in 1965–66 it was 34·4% higher than in 1960–61.

It is clear that the entire amount of the per student expenditure on universities cannot be treated as investment in research activities. And until we know the proportion of this amount which goes to research, we cannot say what really has been happening to research expenditure in our universities. However, even if all the expenditure incurred on a university student is research investment, a suitable deflation of such expenditure by price changes would not leave us much better off than in 1950–51.

Section V

Review of Literature and Problems in Measurement of Cost-Benefit in Education

R. C. Sharma, in his paper *Benefit-Cost Analysis of Educational Projects—A Review of Researches* raises major issues that have come up in the application of cost-benefit technique in the field of educational planning. The paper mainly deals with classification of benefits and costs, methods of measurement of benefits and costs (both from the individual point of view and from the point of view of society), relevance of multiplier and inter-generational benefits and costs in the framework of benefit-cost analysis and the special problems of application of techniques such as choice of life of a project, discount rates, impact of the market imperfection and of unemployment on benefit-costs calculations. He points out that choice of prices for monetary transformation of benefits and costs will be a serious problem. There are also problems like the shortage of resources acting as constraint on our choice, and the problem of interdependence of projects like health or different types of education.

C. B. Padmanabhan, in his paper *Problems Involved in Measuring Cost, Efficiency and Productivity of the Indian Educational System* deals with the internal and external efficiency of educational systems and also discusses the need for evolving different indices to find the impact of education on cultural development, economic well-being and other aspects of development.

Chapter Thirty-One

Benefit-Cost Analysis of Educational Projects : A Review of Researches

R. C. SHARMA

Introductory

Interest in benefit-cost analysis of educational projects has started growing during the past few years. The reasons for this are two-fold. Firstly, governmental expenditure over education is increasing and forms a substantial sum which can be incurred only if the accruing benefits are commensurate with costs. Secondly, education is now considered an investment and as an investment it can be undertaken if the benefit-cost ratio for education compares fairly well with the benefit-cost ratios for other investment projects. These reasons, however, do not suggest that economic criterion is the only one which should be used to justify educational expenditures. Sometimes, it may be so poor as to be completely ignored. The question as to whether or not the economic criterion should be ignored is not answered by benefit-cost analysis, because benefit-cost analysis can not provide any framework of objectives in which decisions should be made. The framework has to be decided upon in advance through various social and political decisions made through voting behaviour or other considerations.

Through benefit-cost analysis of educational projects, or even of new schemes, decision makers get data useful for making choices regarding the selection or rejection of a project. Since choice involves maximization of the present value of all benefits less that of costs, subject to specified constraints, it is a precondition of benefit-cost analysis to identify all the benefits and costs. The benefits are usually identified and their contribution is often analysed, in terms of the goals of national development. These goals, generally speaking are: increasing per capita national income, reducing unemployment, improving income distribution, reducing disparities in income among regions, improving health standards of the nation, etc. If these goals are denoted by letters A, B, C, D, etc. and if the preference function of the nation is such that the value of one unit of each of the variables A, B, C, D, etc. is p, q, r, s, etc. the total value of the benefit of a project which contributes a, b, c, d, etc. units towards variables A, B, C, D, etc. will be $a \times p + b \times q + c \times r + d \times s$, etc. This procedure of valuation has many assumptions as for example the preference function (that is the weights p, q, r, s, etc.) does not change over time.

Suffice to say here, if it is possible to find out the present value of all the benefits and costs, benefit-cost analysis can undoubtedly be used to direct educational decisions regarding the choice of projects. Before this issue is analysed it may probably be useful to review literature which throws some light on the following questions.

How have the benefits and costs of different educational projects been enumerated? How have they been measured? What are the problems faced in their measurement? Are these problems so intricate as to make the application of benefit-cost analysis to education meaningless or even misleading ?

CLASSIFICATION OF BENEFITS AND COSTS

Benefits

Benefit-cost analysis studies have been conducted in respect of a few educational projects. Needless to mention here that education, as a whole, can not be treated as a project. It is rather a coordinated set of projects and can better be called a programme. The projects, under education which have been subjected to benefit-cost analysis are public education, teacher education, vocational education and nursing education but most of the available work is on public education. The problem in all these studies has been that of enumeration and classification of benefits.

Weisbrod[1] enumerates the benefits of public education and classifies them under two categories: Benefits internal to the student and benefits external to him. The former he subdivides into five categories which are as follows: (i) Financial return accompanying additional education. (ii) Financial option return, that is, the value of the option to obtain further education and the rewards accompanying it. (The option value approach attributes to investment in one level of schooling a portion of the additional return over cost which can be obtained from further education.) (iii) The non-monetary ‘ opportunity operations ’ involving the broadened individual employment choices which education permits. (To some extent educated people may prefer a job which may carry relatively less salary but has more non-monetary benefits like enhanced leisure, greater security, etc.) (iv) Hedging option. (Education provides opportunities for ‘ hedging ’ against the vicissitudes of technological change and the obsolescence of skills.) (v) The non-market benefits like the preparation of his own income-tax return by an educated person.

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[1] Burton A. Weisbrod, *External Benefits of Public Education*, New Jersey, Princeton Industrial Relations Centre, 1964, p. 20.

The other types of benefits of public education, Weisbrod refers to, are external benefits. These are drawn by three types of beneficiaries: (i) The residence related beneficiaries like the current and future families of the person receiving education, the neighbours, and the tax-payers. The current family benefits accrue when the children go to school and their mothers go for work. The future family benefits accrue when the student becomes adult and his children get informal education at home. Benefits from one's education also accrue to one's neighbours. The neighbours benefit because educated people have better social values and behaviour norms. The tax-payer, that is the community benefits because its law enforcement costs are reduced. (ii) The employment related beneficiaries. The education of one worker has favourable effects upon the education of another in the sense that ideas are developed when educated people interact and many a time improvements in the methods and techniques of doing work are effected. (iii) Society in general, included in this category are the inter-generational effects of public education and many other advantages which make possible diffusion of innovation, a net-work of widespread communications, a banking system, etc.

Perhaps, a little different to the Weisbrod's classification is the one given by Hirsch *et al.*[2] These authors divide the benefits of public education into four categories which are as follows: (i) Direct long-run benefits (increased earnings, increased satisfaction); (ii) Direct short-run benefits (increased income of mothers for whom schools provide ' baby sitting ' type of service, satisfaction gained by parents on account of the education of their children); (iii) Indirect long-run benefits (tax reduction for non-student families because educated people have higher income and pay more tax, increased earnings of co-workers, informal education in the students future homes, reduced expenditure on maintenance of law and order, improved living conditions of neighbours, improved supply of skilled personnel, creation of an informed electorate); (iv) Indirect short-run benefits (tax reductions for non-student families resulting from the incomes of students' working mothers).

Sharma[3] classifies the benefits of teacher education as internal and external ones. He defines internal benefits as those which accrue to the recipient of education and his family. He, further, classifies the internal benefits as monetary and non-monetary. He defines monetary benefits as salary, allowances, fringe-benefits and other earnings that can be ascribed to teacher education. He defines internal non-monetary benefits as those which lead to increased satisfaction, increased options, guidance to children, etc. Sharma also subdivides external benefits into two categories: monetary and non-monetary. He defines external monetary benefits as including increase in taxes, increase in national income, and savings in the administration of law and justice, and external non-monetary benefits as including the spillover effects of education, income distribution effects, etc.

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[2] Werner Z. Hirsch, Elbert W. Segelhorst and Mortor J. Marches, *Spillover of Public Education: Costs and Benefits*, Los Angles, University of California, 1964, p. 263.

[3] R. C. Sharma, *A Benefit-Cost Analysis of Teacher Education* (Unpublished Doctoral Dissertation), New York, Teachers College, Columbia University.

Costs

Schultz delineates different types of costs[4] that should be taken into account in assessing the economic value of education. He makes it clear that his attempt is limited to factor costs of schooling and does not include the costs of activities like university research which do not directly serve educational purposes. Schultz then defines total factor costs of schooling as the costs paid by the student and his family and the costs paid by others as for example community, state, federal government, voluntary organizations, etc. The costs paid by the student and his family can be called private costs. Private costs include, in addition to the costs of schooling borne by students and their families 'the school taxes borne by them, the financial aid given by them in the case of parochial schools and the opportunity costs that are represented by earnings that students forego while attending school'[5] 'To these must also be added the profits foregone by a family on stocks in corporations that make grants to the school which the children attend.'[6]

Becker like Schultz classifies costs as private and social and subdivides each of these into direct and indirect. By direct private costs he means costs of tuition, books and supplies and additional living expenditure incurred by students. By indirect private costs he means income foregone by students. Becker defines direct social costs as 'the sum of educational expenditure incurred by colleges and the social costs of books and additional living expenses'.[7] He defines indirect social costs as the taxes foregone on earnings foregone. Becker further poses the problem that the earnings of a person are not only due to formal schooling. They are also due to on-the-job training, migration, information in the labour market and physical and mental health of the earning person. Ingenious discussion on each of these costs is found in the article, *Investments in Human Beings.*[8] Becker, however, fails to take into account all social opportunity costs.

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[4] Theodore W. Schultz, *The Economic Value of Education*, New York, Columbia University Press, 1964, p. 20.

[5] Theodore W. Schultz, *The Economics Value of Education*, New York, Columbia University Press, 1964, p. 21.

[6] *Ibid.*

[7] Gary S. Becker, *Human Capital*, New York, Columbia University Press, 1964, p. 119.

Pandit[9] classifies the cost of education at school stage as institutional cost, student cost and opportunity cost. He defines institutional cost as having the following components: (i) Capital cost (*i.e.* non-recurring costs as of land and buildings, laboratory, hospitals, water-works, library, hostels, etc.); (ii) Equipment cost; (iii) Non-divisible recurring costs. Pandit defines student costs as including tuition and fees, cost of books, equipment and stationery purchased by the students and not supplied by institution from its funds, additional living expenditure and transportation charges. He defines opportunity cost as income foregone by students. Obviously Pandit has not included the income foregone by government because schools are exempt from certain taxes. Incidently, it may be mentioned here that Becker has included these taxes in his calculations. But Pandit has taken into consideration the diminution in national income (external monetary benefit) foregone by the nation over and above the income (internal-monetary benefit) foregone by the student whereas Becker has not done this.

METHODS OF MEASUREMENT OF BENEFITS AND COSTS

Benefits

Recently some studies have been conducted in which attempts have been made to measure private monetary benefits of public education, of preventing drop-out and of teacher education. Attempts to measure social monetary benefits have also been made. There is, however, only one study available in which non-monetary benefits of teacher education have been measured.[10]

Attempts made so far at measuring monetary-private benefits, have utilized cross-sectional data in a chosen year, to estimate the life-time earnings of individuals with differential amounts of education. In other words, these attempts assumed that the income earned by different age-groups in a year could be used to measure the income of a cohort as it aged and retired from the work force. That is they assumed that cross-sectional data could be converted into longitudinal data. The reasons for following this approach, instead of tracing a man's income from the time he enters the labour market till he leaves it due to any reason, have been given, quite convincingly, by Miller[11] in the following quotation from Woytinsky: 'Cross-sectional data have the advantage that they are free from the influence of variants such as periods of industrial depression, or usual activity with changes in opportunities for employment, in wage rates and in cost of living.'

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[8] 'Investments in Human Beings', *The Journal of Political Economy*, LXX (Part 2) Supplement, October, 1962.

[9] H. N. Pandit, *A Study in Unit Cost at the School Stage in India* (An outline of the NIE-HEW Project 0015), New Delhi, National Institute of Education, 1967, pp. 5-6.

[10] R. C. Sharma, *A Benefit-Cost Analysis of Teacher Education* (Unpublished Doctoral Dissertation), New York, Teachers College, Columbia University, 1967.

Miller[12] has strengthened this argument by comparing the life-time earning of a college graduate in 1949 and 1958, and by concluding: 'The observed difference of the value of $ 140,000 reflects the increases in prices as well as changes in the underlying relationships. These factors demonstrate an important advantage of the cross-sectional approach used in preparing the estimates. Since the averages used for each year are based on the experience for that year, they implicitly provide estimates in dollars of constant purchasing power.'

On the basis of cross-sectional data obtained from the Census records, research workers have prepared age-income profiles and have used them to draw conclusions in regard to education-income relationships. The conclusions drawn are based on two types of analysis. One type used by Miller[13] and Houthakker,[14] is known as the additional life-time method. The other used by Becker[15] and Hansen[16] is known as the 'internal rate of return' approach.

To illustrate how Miller calculated the life-time income from the cross-sectional data, let it be assumed that a number of infants, say n, were born in the year x. Of these n infants, say, s survived to reach the age of 18, when they entered the labour force. Miller estimated the life-span of these s survivors on the assumption that the survival rate for men in each education group was same as for white males in the year x. Thus, if the white man in the year x had a life-expectancy of m years beyond 18, s persons would live for ms man-years. Given the salary rate per man-year, he calculated life-time income for persons having different levels of education.

Miller's estimates of life-time for the year 1939 are based on wages and salaries, for 1946 they are based on earnings, and for 1949, 1956, and 1958 they are based on total income. These estimates have not been discounted and adjusted for economic growth. Miller, however, advocated such suggestions subsequently.[17] He suggested that the present value of the life-time income should be calculated by the formula:

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[11] Herman P. Miller, 'Income in Relation to Education', *American Economic Review*, L(5), December, 1960, p. 979.

[12] *Ibid.*, pp. 980-981.

[13] Herman P. Miller, 'Income in Relation to Education', *American Economic Review*, L(5), December, 1960, pp. 980-981.

[14] H. S. Houthakker, 'Education and Income', *Review of Economics and Statistics*, XLI, February, 1959, pp. 24-28.

[15] Gary S. Becker, *Human Capital*, New York, Columbia University Press, 1964.

[16] W. L. Hansen, 'Total and Private Rates of Return to Investment in Schooling,' *Journal of Political Economy*, April, 1964, pp. 128-41.

$$V_{18} = \sum_{n=18}^{45} \frac{Y_n \cdot W_n \cdot P_n (1+x)}{(I+r)^{n-18}} + \sum_{n=46}^{75} \frac{Y_n \cdot W_n \cdot P_n (1+y)}{(I+r)^{n-18}}$$

Where V^{18} is the present value of life-time income, the working life-span is from 18 to 75 years, Y_n is the average income of a person in the education group whose life-time earnings are being estimated, W_n is the proportion of persons with income Y_n, P_n is the probability of surviving 1 year,[18] r is the discount rate and x and y are the gains in income associated with economic growth.

Houthakker in his study points out that the Census data present median incomes which are certainly not the type of average to be used for studying income since income-distributions are positively skewed. He, therefore, suggests the use of mean. He used the points given in parenthesis to calculate means: $ 1-499 ($ 400), $ 500-999 ($ 900), $ 1,000-1,499 ($ 1,400), $ 2,000-2,499 ($ 2,300), $ 2,500-2,999 ($ 2,800), $ 3,000-3,999 ($ 3,500), $ 4,000-4,999 ($ 4,400), $ 5,000-5999 ($ 5,400), $ 6,000-6,999 ($ 6,300), $ 7,000-9,999 ($ 8,000) and $ 10,000 and over ($ 22,000). Houthakker arrives at these points by inspection of data. He arrives at the last point by assuming a Pareto constant of 1·9. He adjusts these mean incomes for mortality and then obtains their present values at different discount rates.

Schultz found that the life-time income of males, 'from age 18 to 64 in 1939 with four, or more, years of college exceeded that of such male high school graduates by $ 39,00. Total Costs were $ 1,087 per year, thus $ 4,348 for four years of college. The earnings-cost ratio (*i.e.* undiscounted internal monetary benefit-cost ratio) would, therefore, be 8·97[19], (parentheses mine). Schultz estimated that in the year 1956, returns on college education were 9·77 per cent, they were 11·27 per cent on high school education and 38·4 per cent on elementary education. With a weight of 27, 45 and 28 at college, high school and elementary education levels respectively, the least return on educational stock as a whole, will be 17·4 per cent or 17 per cent nearly.[20]

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[17] Herman P. Miller, 'Life-time Income and Economic Growth' *American Economic Review*, LV, September, 1965, pp. 834-844.

[18] This refers to the probability of survival at the age of *n* years.

[19] Theodore W. Schultz, 'Education and Economic Growth', *Social Forces Influencing American Education*, Sixtieth Year Book of the National Society for the Study of Education, 1961, p. 78.

Becker follows the same method as Miller and Houthakker but unlike Houthakker and like Miller, he uses the midpoints of all closed income-classes to calculate means for different education-age groups. But unlike Miller, he uses Pareto distribution to estimate incomes in the open-end class. Houthakker also uses Pareto distribution, but Becker differs from him because the latter's open-end class means rise with age and education from $ 15,000 to $ 27,000 whereas the former uses the same open-end mean at all age and educational levels. With these representative income points, Becker arrives at his income-estimates which he adjusts for mortality, growth, taxation, unemployment and under and over-reporting of incomes. Becker's findings are: The rate of return to an average college entrant is considerable, of the order of 10 or 12 per cent per annum. The rate is higher to some and lower to others; 'It is higher to urban white, male college graduates and lower to college drop-outs, non-whites, women and rural persons. Differences in the relative number of, say, white and non-white or urban and rural high school graduates who go to college are consistent with their rates of return.'[21]

Becker accepts that the estimates of the rate of return on education drawn on the basis of income differentials among persons differing in education are often highly over-estimated because many other variables which are related both to income and education, intervene, as for example, intelligence, race, sex, parental status, urban-rural and maturity status, etc. To eliminate the influence of some of these factors he confined his analysis to urban white males. To discount the effect of intelligence upon income he quotes many studies and concludes, 'Five independent adjustments for differential ability-adjustments that cover such diverse influences as rank in class, I. Q., father's education and occupation, personality, ability to communicate, motivation and family upbringing—all suggest that college education itself explains most of the unadjusted earnings differentials between college and high school graduates.'[22]

Hansen derives estimates of the internal money rates of return to both total and private resource investment, but instead of calculating capital values, he calculates marginal rates of return. The marginal and average rates calculated by him are measures of the monetary benefits. Like monetary benefits, can non-monetary benefits be measured? Blaug[23] answers this question by analysing all benefits which can and can not be measured. He classifies benefits as follows: (i) The current spillover income gains to persons other than those who receive extra-education; (ii) The inter-generational benefits of education; (iii) The supply of convenient mechanism to discover and cultivate potential talent; (iv) The means of assuring occupational flexibility of the labour force and thus to furnish the skilled manpower requirements of a growing economy; (v) The provision of an environment that stimulates research in science and technology; (vi) The tendency to encourage a lawful behaviour and to promote voluntary responsibility for welfare activities, both of which reduce the demand on social services; (vii) The tendency to foster political stability by developing an informed electorate and competent political leadership; (viii) The supply of a certain measure of social control by the transmission of a common cultural heritage; (ix) The enhancement of the enjoyment of leisure by widening the intellectual horizons of both the educated and uneducated.

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[20] *Ibid.*

[21] Gary S. Becker, *Human Capital*, New York, National Bureau of Economic Research, 1964, p. 154.

[22] Gary S. Becker, *Human Capital*, New York, National Bureau of Economic Research, 1964, p. 88.

Blaug argues that the first two benefits are included in the ' Social Rate of Return ' which is an accepted term used to denote only direct and indirect economic benefits of education. These benefits, Blaug says, constitute the first round of benefits. The second round of benefits, he says, is constituted by items, two to six. These benefits are very difficult to be measured. Lower and upper limits for them have been estimated by Becker. He, however, implies what Blaug says a more than warranted confidence in the numerical accuracy of Denison's residual to arrive at his upper limit. Blaug concludes, ' For better or for worse, the direct economic benefits and the first-round spillovers of education remain at present the only ones capable of fairly accurate measurement; and this is the chief if not the only justification for concentrating on them '.[24]

Regarding benefits 7, 8 and 9 Blaug takes the position that they are not relevant to allocative decisions which involve a less than total transformation of society. He does not deny their importance but argues against their measurement on the basis of personal value judgement. However, as a whole he is very supportive of calculating the benefits and costs of education of all kinds. He refutes the argument that education is a public good and, therefore, it is meaningless to calculate the rate of return.

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[23] Mark Blaug, 'The Rate of Return on Investment in Education in Great Britain', *The Manchester School*, XXXIII, September, 1965, pp. 205-251.

[24] Mark Blaug, 'The Rate of Return on Investment in Education in Great Britain', *The Manchester School*, XXXIII, September, 1965, p. 238.

Apart from measuring the private benefits of public education attempts to measure them in respect of some other educational projects have also been made. Sharma[25] studied the private benefits of teacher education. He divided the private benefits under the categories—monetary and non-monetary. He measured the monetary benefits in the same way as the monetary benefits of public education are usually measured. He measured non-monetary benefits in three ways. One way was to assume the least value of non-monetary benefits as equal to the cost of that year of teacher education which does not increase the life-time earnings of the teacher. A second way was to regard the non-monetary benefits equal to the difference between the salary of a teacher and that of a person having equivalent qualifications but working in another avocation. A third way was to regard the income teachers forego in the two months of summer vacations for which they are not paid. This last method is applicable to the U.S.A. only, since teachers are paid there for ten months. Harvey[26] has also calculated the monetary benefits of teacher education. His data relate to Quebec.

Measurement of Social Benefits

So far two methods of measuring social benefits have been used. One is to base calculations on before-tax earnings differentials between educated and uneducated people. This method has been used by Becker to estimate what he calls the lower limit of social gains of education.

Becker says, "the development of a more sophisticated estimate of the social gain is not easy because other external effects are very difficult to measure. The absence of any direct measurements forced me to use an indirect and not very reliable method."[27] The other method is to base calculations on Denison's Residual. Dension has recently estimated the contribution of physical capital, labour, increasing returns and many other factors to economic growth in the United States. After deducting these contributions, a residual is left over that he calls the contribution of 'Advancement in knowledge'. By attributing all of the residual to education, an upper limit to the social effect of education can be developed.

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[25] R. C. Sharma, *Benefit-Cost Analysis of Teacher Education* (Unpublished Doctoral Dissertation), New York, Teachers College, Columbia University, 1967.

[26] Valerien Harvey, *Economic Aspects of Teachers Salaries* (Unpublished Doctoral Thesis), Chicago, University of Chicago, 1967.

[27] Gary S. Becker, *Human Capital*, New York, National Bureau of Economic-Research, 1964, p. 117.

Costs

Costs of education have been measured in a few studies. Schultz[28] measures factor costs of education. He does not examine the costs of such activities as do not directly serve educational purposes. Furthermore, he believes that costs of education cannot be ascertained directly from data on school expenditures, as these data do not cover all those costs borne by the student or his family. By the same token, Schultz says, expenditures made by student's family do not measure the cost of education as they do not include expenditures made by school, the school taxes borne by them, the financial aid given by them in case of parochial schools, and the opportunity costs that are caused by foregone earnings of students.

Schultz finally says that total costs of schooling can be obtained by adding, ' all of the costs borne by the student and all of the costs not borne by him '.[29] Schultz breaks up Total Resource Costs as follows: (1) School costs or costs incurred by society on teachers' salaries, supplies, interest and depreciation on capital; (2) Opportunity costs incurred by individuals, namely, income foregone during school attendance; (3) Incidental school—related costs incurred by individuals, for example on the purchase of books and on travel. Schultz breaks up the Private Resource Costs as follows: (i) Direct costs or costs of tuition, supplies, and additional living expenses; (ii) Opportunity costs incurred by individuals; (iii) Incidental school related costs.[30] In this discussion Schultz makes no reference to taxes foregone by the society on the property owned by schools although in a subsequent writing he refers to these.[31]

Private Direct Costs

Becker estimated private-direct costs from some special studies and from the statistics published by the U.S. Office of Health, Education, and Welfare. He subtracted from the gross tuition and fees, contributions made by the federal government on account of the tuition and fees of veterans. He then made correction for the tuition and fee paid for extension courses and public services, because enrolment figures include such students. Becker also made correction for part-time students by assuming 2 part-timers equivalent to 1 full timer. He found that part-timers were 24 per cent of all male college students. He, therefore, put the number of full-time equivalents, as being 98 per cent of the total enrolment. A third correction which Becker applied was based on the rationale that the tuition paid by students would be lower than the tuition received by colleges because of scholarships from colleges and other sources. He found that scholarships were 20·7 per cent of the tuition. After making all these adjustments, tuition payments were \$ 112 per student in the year 1956 and \$ 242 per student in the year 1958.[32]

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[28] Theodore W. Schultz, *The Economic Value of Education*, New York, Columbia University Press, 1963, p. 21.

[29] *Ibid.*, p. 23.

[30] Theodore W. Schultz, 'Capital Formation by Education', *Journal of Political Economy*, LXVIII, December, 1960, pp. 571-583.

[31] Theodore W. Schultz, *The Economic Value of Education*, New York, Columbia University Press, 1963, p. 21.

Becker calculated the costs on books, supplies, travel between home and school, and capital, as for example, typewriters used by students in school work on the basis of the survey conducted by the U.S. Department of Health, Education, and Welfare in the year 1952–53.[33] He assumed that these expenditures bore the same relationship to tuition and fees as they did in 1952–53. Becker set the high school tuition as zero. He estimated the other direct costs of high-school students by assuming that the ratio of, ' these costs to expenditures per student by high schools equalled one-half the observed ratio for college students '. Becker accepts, ' The use of one-half is quite arbitrary and perhaps a somewhat different ratio would be more justifiable '.[34]

Private Indirect Costs

These are constituted by the earnings foregone by students. In estimating foregone earnings, Schultz assumed that students forego 40 weeks of earnings. He then obtained from the data published by the Bureau of Census and the estimates drawn by Miller, median earnings per week of males and females at different age levels. Using these earnings and the age-distribution of students at different educational levels, Schultz obtained weighted average of earnings at each educational level. The age distribution of high school students used by Schultz was 92·7 per cent students in the age-group 18-19. The age-distribution of college students used by him was: 8·5 per cent students in the age-group 14-17, 34·2 in 18-19, 42·1 in 20-24 and 15·2 in 25-29. The estimates of earnings foregone by high school and college students obtained by Schultz were \$ 583 and \$ 1,369 respectively. These were equivalent to 11 weeks and 25 weeks of earnings of workers in manufacturing. Thus, if the average weekly earnings in manufacturing were \$ X in a year n, Schultz says that the earnings foregone, will be $\$\ IIX$ for high school students and $\$\ 25X$ for college students. Schultz suggests that these earnings should be corrected for unemployment. Accordingly, if the rate of unemployment in the year n was 11 per cent, the earnings foregone by a high school and college student were $\$\ 11X\ (1-r)$ and $\$\ 25X\ (1-r)$ respectively. These figures are based on the assumption that the relationships which existed in the year 1949 also existed in the nth year.

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[32] Gary S. Becker, *Human Capital*, New York, National Bureau of Economic Research, 1964, p. 174.

[33] U. S. Department of Health, Education and Welfare, *Costs of Attending College* (Bulletin No. 9), Washington, D. C., U. S. Government Printing Office, 1957.

[34] Gary S. Becker, *Human Capital*, New York, National Bureau of Economic Research, 1964, p. 174.

Schultz points out the limitations and rationale of this procedure in the following words:[35]

> 'Many of the young people who did work in 1949 were employed for only a few weeks during the year. It seems plausible that their earnings per week would be below those of workers of equivalent abilities who worked most or all of the year. To this extent our estimates are too low. Also, it could be that students rate somewhat higher per person in the particular abilities for which earnings are received than do those not in school who are earning income. To the extent that there are such differences, other things being equal, our estimates of earnings foregone are again too low. On the other hand some students have held jobs while they were attending school; the earnings they have received from such jobs should have been subtracted from our estimates. Then too, young people are probably overburdened with more unemployment relative to the number employed than is the labour force as a whole. Thus, of the four factors just mentioned two pull in one direction, two in the other. They may be compensating factors.'

Despite the foregoing rationale given by Schultz, Blitz feels that the estimates drawn by Schultz have a downward bias, especially for younger age-groups. Blitz puts forward the following arguments in support of his position (i) 'Three-quarters of the population of high school age are actually in high school, the majority of them hold only casual jobs and do not realize their full potential in the labour market'.[36] (ii) Most of the casual workers work less than a full forty hour week. (iii) The full-time workers of high school age have lesser productive abilities than high school students. (iv) Due to summer vacations students take jobs in summers and there is an increase in the supply of workers which reduce their wages. (v) The use of median instead of mean gives a downward bias to income data. In further support of his position Blitz reviews five studies all of which yield an estimate of foregone income, at least 50 per cent higher than Schultz' figure for the same year.[37]

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[35] Theodore W. Schultz, 'Capital Formation by Education', *Journal of Political Economy*, LXVIII, December, 1960, p. 574.

[36] Rudolph C. Blitz, 'A Calculation of Income Foregone by Students,' Supplement to Nation's Educational Outlay in Selma Mushkin (Ed.) *Economics of Higher Education*, Washington D.C.U.S. Department of Health, Education and Welfare, 1962, p. 391.

Becker estimates foregone earnings in a slightly different way. He argues that full time students spend three-fourth of their available working time in school and could, therefore, work in the remaining one-fourth time. He then collects some data in support of his argument and finally concludes that college students ' earn about one-quarter of the amount earned by high school graduates of the same age ',[38] and that high school students earn one-quarter of the estimated earnings of elementary school graduates of the age, 14 to 17.[39]

Social Direct Costs

Becker says that ' social-direct costs equal the sum of current educational expenditures, capital used upon education and property taxes that would have been levied, if schools were not tax-exempt '.[40] He calculated current educational expenditures by subtracting from the total educational expenditures, non-educational expenditures, that is expenditure on extension, organized research and organized activities relating to departments. He estimated the amount of tangible capital from an unpublished study by Robert Rude. This study gives capital per school. By dividing capital per school by the number of students per school, Becker obtained capital per-student. He then made an adjustment in his estimate for capital used on non-educational activities. He obtained the expenditures of high schools from the combined figures for high schools and elementary schools published by the U.S. Office of Education by using the formula $wX + (1-w)\ X = y$ where X is expenditure in high school, y is the combined expenditure for high schools and elementary schools, w is the fraction of students in high schools and a is the ratio of the expenditure per student in an elementary school to the one in high school. Becker calculated the value of a from the Statistical Summary of Education published by the U.S. Department of Education. He obtained w and y from the Biennial Survey of the U.S. Department of Education.[41]

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[37] *Ibid.*, pp. 390-403.

[38] Gary S. Becker, *Human Capital*, New York, National Bureau of Economic Research, 1964, p. 171.

[39] Gary S. Becker, *Human Capital*, New York, National Bureau of Economic Research, 1964, p. 172.

[40] *Ibid.*, p. 175.

[41] *Ibid.*

Social Indirect Cost

The social indirect costs were obtained by Becker by adding the values of the property tax foregone on the property owned by educational institutions and the opportunity cost of capital used in education. The latter measures the rate of return on other capital *plus* the depreciation on educational capital. Becker assumed the opportunity cost of capital to be 10 per cent of its value per year. He found the value of property tax foregone to be $ 18 per student in 1939 and $ 21 per student in 1949[42].

Sharma[43] calculated the social-indirect cost of teacher education by imputing the value of property tax exempted, assuming that it was a linear function of the replacement value of the real estate used by colleges and universities. He also took into account other taxes from which schools were exempted. Sharma also calculated foregone income-tax on the foregone earnings of students. He arrived at his lower limit of the social indirect costs by adding all these taxes. He estimated the upper limit by multiplying the income foregone by ·87. The rationale for this was derived from Denison's work. Denison[44] estimated that 23 per cent of the economic growth during 1929–57 was caused by improvements in education, and another 20 per cent which was the residual was caused by advancement in knowledge which can again be attributed to education and research. Assuming that the advancement in knowledge caused by teacher education was of the same order, as it was, on an average, in other sectors and disciplines, the ratio between the income resulting from improvement in education and advancement in knowledge will be 23 to 20 or 1 : ·87.

PROBLEMS AND ISSUES IN THE MEASUREMENT OF BENEFITS AND COSTS

Which Benefits and Costs Should be Included

Benefits

The foregoing review of the measurement of benefits and costs suggests that the measurement problems are by far not easy. First it is difficult to decide which classification of the benefits should be followed. Is a classification into consumption and non-consumption benefits[45] more desirable than to treat all benefits as non-consumption benefits? Maybe some educational projects, as for example engineering education result in fewer consumption benefits than liberal arts education, but the monetary benefits on the former are far higher than the latter. If, decisions are made on the basis of only monetary benefits, engineering education will probably have a much higher benefit-cost ratio than liberal arts education, but if all benefits are taken into consideration these ratios may not be much different.

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[42] *Ibid.*

[43] R. C. Sharma, *A Benefit Cost Analysis of Teacher Education* (Unpublished Doctoral Dissertation), New York, Teachers College, Columbia University, 1967, pp. 146-147.

[44] E. F. Denison, *The Residual Factor and Economic Growth* (Paris, Organization for Economic Corporation and Development 1964), pp. 19-35.

[45] The definition of consumption benefits is not same as given by Stephen A. Marglin in his *Public Investment Criteria*, London, George Allen and Unwin, 1967 pp. 19-20 and 40-43.

If the latter really comes to be true, should the government accord same priority to both the projects? That is, should consumption of education guide the allocation decisions of government? Will that not result in a poor allocation or missallocation of resources? If only monetary benefits direct the investment decisions, many educational projects which improve the human infra-structure by improving the general understanding, achievement motive and change proneness of people will have to be dropped because such projects usually have low monetary benefits and a low monetary benefit-cost ratio. Will dropping them be a sound decision, when it is believed increasingly that economic development of a nation depends upon the aspirational level, achievement motive, change proneness and several other non-economic factors?

Costs

Similarly the issue is: Which costs should be included in the analysis? Should only primary costs (*i.e.* the costs of the educational establishment, its maintenance and operation, the student costs including foregone earnings and foregone income by government on account of schools being exempted from certain taxes) be included? Or, should associated costs and secondary costs be also included? Thus, if teachers purchase books from their own pocket to improve their teaching skills, should this expenditure be counted as a cost of education? Will this create problems of double counting? Is such expenditure not included in the cost of education in institutions where library purchases such books? Similarly should or should not expenditure on research and seminars designed to improve teacher efficiency, instructional materials or instructional programmes be included in the costs of education?

ESTIMATION OF THE VALUE OF BENEFITS

Non-monetary and External Benefits. The main problem in this connection is to measure the private non-monetary and external benefits of educational projects. Are the methods of measuring private non-monetary benefits given by Sharma (Supra, p. 281) adequate? Or, should some other methods be used? If so, what can these be? Regarding external benefits, is it adequate to set a lower limit to them on the basis of taxes on the additional income of educated people? Further, is it sound to calculate the upper limit on the basis of Denison's residual *i.e.* advancement in knowledge? Although it is not quite logical to assume as Denison does that all the residual is due to advancement in knowledge, yet if such an assumption is made, it is not feasible on any rational basis to distribute it among different educational projects. In other words the problem is to decide how much of the residual is due to engineering education, social research, etc.? It may also be considered as to how to measure the external non-monetary benefits?

Effects of Projects on National Goals of Development. Further, it may be considered as to how to measure the effects of education on improving the income distribution in the country? Needless to say there is a high positive correlation between education and income. Education is certainly an important investment in reducing income disparities. Nevertheless, no study conducted so far has included it in analysis. These studies have also not included the employment and other effects of educational projects. Which of these effects are important in under-developed countries?

Ex-ante or Ex-post Evaluations of Consumption Benefits. Wiseman[46] points out that measurement of benefits is complicated by the fact that education changes the expectations and values of the educand. Consequently the ex-ante and ex-post evaluation of the consumption benefits, made by the educand, is different. For illustration, Wiseman argues, if education changes a Beatle-maniac into a Bach-lover and the changed man appreciates Bach and can no longer tolerate Beatles, should we not deduct the loss of consumption this change implies? 'Or, should we abandon the attempt to measure psychic returns as fruitless? Or, should we treat the ex-post valuation (at what point?) as relevant, despite the fact that it has been created by education itself?'[47]

Schultz in a rejoinder tries to answer some of the questions posed by Wiseman. He says that many parts of the empirical edifice of economics are imperfect, and most of what is done under economic estimation will not pass close inspection by Wiseman's test. Schultz, further, says that the plea that education changes Beatle-maniacs into Bach-lovers by changing their attitudes, expectations and preference patterns, and, therefore, creates very complicated and insoluble valuation problems is just worrying too much, because education can not turn Bach-lovers into Beatle-maniacs.[48] Perhaps, the rationale at the back of Schultz' argument is that education enriches life and adds to consumer satisfactions, and as an accepted means of promoting social good can not be assumed as leading to consumer losses. The present author shares his convictions with Schultz. However, the issue merits further discussion.

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[46] Jack Wiseman, 'Cost-Benefit Analysis in Education' *The Southern Economic Journal*, XXXII, July 1965, pp. 1-13.

[47] *Ibid.*

Multiplier Effects of Educational Expenditures. Another issue which needs discussion is; should the interactional effects of the accelerator and the multiplier caused by educational expenditures be taken into account? Excluding these benefits reduces the value of the total benefits. Furthermore, since the expenditures on many educational projects are sufficiently large, their multiplier effects are by no means insignificant. Nevertheless, these effects have not been examined in any study. Should they then be examined?

Estimation of the Life of a Project. This involves decisions not only about an appropriate rate of discount for depreciation of human capital but also about making allowance for obsolescence. Many a time due to technological advances, skills get obsolete and have to be replaced by new ones. Allowances for these and other shifts in demand have to be made. This, however, makes the estimation, often, quite subjective. Perhaps, in most educational projects subjectivity is not so pronounced since the life of the bulk of human capital is known in the sense that men and women retire at a prescribed age. Further, during their working period they do not get obsolete; they train themselves in the new skills in demand. Should then allowance be made for obsolescence by including the cost of the relevant on-the-job training programmes in the cost of the educational project under investigation? Or, should these training programmes be not isolated from the other on-the-job training programmes and should, therefore, be included in the rate of return calculations on the on-the-job training?

Selection of Prices to Make Benefit-cost Calculations. When decisions about the length of the life of a project have been made, the next decision to be made is what prices should be used to calculate costs and benefits. Should the changes in the general price level be used? Or should prices prevalent in the initial year of starting the project be used? Miller uses prices prevalent in the initial year to calculate the monetary benefits of education.[49] Becker also uses the prices prevalent in the initial year.[50] Nevertheless, in countries where sudden rise in educational expenditures is contemplated, the prevalent prices can not be used validly. In such cases if the old prices are multiplied by the increase in output, an over-estimate is obtained whereas if the prices (prices after the impact of the project have been felt) are not multiplied an under-estimate is obtained. ' What is needed, as has long been recognized, is a measure of the addition to the area under the demand curve, which, on the assumption that the marginal utility of money remains unchanged is an appropriate measure of the money value of the benefits provided in the sense of assessing what the recipients would pay rather than go without them '.[51] When the demand curve is linear, an unweighted average of the before and after prices will suffice, but complicated techniques have to be used for other forms of demand function.

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[48] Theodore W. Schultz, 'Comment' *The Southern Economic Journal*, XXXII, July, 1965., p. 14.

[49] Herman P. Miller, 'Life-time Income and Economics Growth', *American Economic Review*, September 1965, pp. 834-844.

[50] Gary S. Becker, *Human Capital*, New York, National Bureau of Economic Research, 1964, p. 73.

Similar and no less difficult problems are involved in the valuation of costs.[52] First it is necessary to adjust prices of factors so as to eliminate any rental elements which will be measured by excesses over transfer earnings in their next best alternative use. Second, one has an exactly analogous problem on the demand side, in that as more and more of a factor is absorbed in any one line of output the price of the alternative product which it might have been making rises further and further. Therefore, we are faced with the choice between valuation of a factor at original price (*i.e.* that ruling prior to the expansion of output of commodity in question) the ultimate price, or some intermediate level. On the assumption of linearity, a price half-way between the original and ultimate levels will meet the bill, as on the demand side. These problems have also been discussed in comprehensive detail by Lerner.[53]

Making Adjustments for Market Imperfections. There are also difficulties in the valuation of costs and benefits caused by market imperfections. In an imperfect market, decisions based on valuations of costs and benefits at the market price present a very distorted view of the problem of allocation of resources and actually lead to sub-optimal allocation of investment projects. In order to avoid such problems adjustments have to be made for the market imperfections by discounting the market prices. There are two methods of doing this. One is to apply a correction on the prevalent market prices. Another is to apply correction while estimating costs and benefits. Usually the first method is applied by using shadow prices and opportunity costs. Should shadow prices be used in estimating the benefits of educational projects because teachers work under conditions of oligopsony and their salaries are not infrequently depressed below what they would be under conditions of perfect competition? Or, should shadow prices be not used, because of other more important reasons? In the analysis of educational projects attempted so far, shadow prices have not been used, however.

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[51] A. R. Prest and R. Turvey, 'Cost-Benefit Analysis: A Survey', *The Economic Journal*, LXXV, December, 1965, p. 693.

[52] *Ibid*, p. 691.

[53] A. P. Lerner, *Economics of Control*, New York, Macmillan, 1944.

Making Adjustment for Unemployment. Like imperfect competition, and often mediating it unemployment prevalent at the time of a study also warrants the use of shadow prices. When there is widespread unemployment labour's opportunity cost is near zero. Eventually, its shadow price is well below the prevailing salaries of those workers who are employed. Under these circumstances governmental spending on any project has a multiplier effect upon the economy and augments real incomes which if not taken into consideration would understate the benefits and overstate the social costs. However, all economists do not support such corrections. For example, McKean[54] is against them. His argument is that when labour is overpriced, equipment, fuel and other materials also tend to be overpriced. Thus, correction in the former leads to the poor estimation of the latter. He further says that correcting future costs requires estimation of further unemployment which is very difficult to be made for various reasons.

Choice of Discount Rate. Having valued benefits and costs, the next problem is that of the choice of the appropriate rate of interest or discount for public investments. Should the rate of interest be an average risk-free long-term rate? Or, should it be presumed that the market rates of interest do not bear any close relationship to the marginal productivity of investment and time-preference or that the relationship is so blurred as to be imperceptible? In answer to these questions, if a perfect market is assumed, even then it is doubtful whether the market determined interest rate would suffice for community decisions, because it is often believed that social time preference attaches more weight to the future than private time preference. Pigou[55] supported this position by arguing that individuals were short sighted about the future and it is governments alone which could give due weight to the welfare of the unborn generations. More recently Marglin[56] has supported this position and advocated the view that the social discount rate must be determined by the rate of the economic growth of the country. It is on the choice of the growth rate that capital-output ratio can be used to determine the total volume of investment in the country.[57]

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[54] R. N. McKean, *Efficiency in Government Through Systems Analysis*, New York, John Wiley, 1958, Chapter VIII.

[55] A. C. Pigou, *Economics of Welfare*, London, Macmillan, 1932, Chap. II.

[56] Stephen A. Marglin, 'The Social Rate of Discount and Optimal Rate of Investment, *Quarterly Journal of Economics*, Vol. LXXVII, February, 1963, p. 110. '*The Opportunity Costs of Public Investment*, *Quarterly Journal of Economics*, Vol. LXXVII, May 1963, p. 274-289.

Despite this method, determination of the social rate of discount is yet a controversial issue. A second difficulty in operating the social discount rate is that different rates of interest would be used in public and private sectors. The solution for this is that government should take action to push down the rates of interest to the social rate. Sometimes it is said that the rate of governmental borrowing can be regarded as the risk-free rate of interest but nobody has demonstrated this. In other words, nobody has demonstrated that the marginal efficiency of private investment is equal to the risk-free rate of interest. (That is, people will not invest money in business if the former is lower than the latter). Even if somebody had demonstrated it, it would have been true of private investment and would not have applied to public investment. An alternative to public investment as Krutilla and Eckstein[58] have assumed would be a tax cut. These authors considered the ways in which a hypothetical tax cut would affect income groups and then asked how the national recipients would utilize their receipts and thus arrived at a weighted average rate of return. They further postulated that the effects of a tighter public investment may be offset by a tighter monetary policy and therefore, making allowance for it they calculated that the federal capital in the late fifties had an opportunity cost of 5 to 6 per cent. This approach has been severely criticized.

McKean[59] argues that there is no need for calculating an opportunity-cost rate of interest, especially when the budget is fixed and there is no opportunity cost of capital. Turvey has pointed out the limitations of this approach and has presented a lucid exposition on the issue.[60] Also some other authors have emphasized the need of calculating a social discount rate. They have also argued that it should not be assumed free of uncertainty. They believe that allowances for uncertainty can be made '(i) in the assessments of annual levels of benefits and costs; (ii) in the assumptions about length of life; and (iii) in the discount rate '.[61] However, in practice such subtleties and refinements do not work. In practice, the most usual procedure is 'to select an interest rate or rates on the basis of observed rates ruling at the time, for calculating present values, etc '[62] For example, Weisbrod takes 10 per cent as the opportunity cost for the private sector and 4 per cent for the federal borrowing.[63]

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[57] Jan Tinbargen, 'Educational Assessments,' *Economic and Social Aspects of Educational Planning*, Paris, UNESCO, 1964, pp. 165-222.

[58] J. V. Krutilla and Otto Eckstein, *Multipurpose River Development*, Baltimore, Johns Hopkins Press, 1958, Chap. IV.

[59] R. N. McKean, *Efficiency in Government Through Systems Analysis*, New York, John Wiley, 1958, Chap. 4.

[60] Ralph Turvey, 'Present Value Versus Internal Rate of Return: An Essay in the Theory of the Third Best', *Economic Journal*, LXXIII, March 1963, pp. 93-98.

[61] A. R. Prest and R. Turvey, 'Cost-Benefit Analysis: A Survey, *The Economic Journal*, LXXV, December 1965, p. 700.

Conclusion

Do the foregoing issues and the nature of most of the benefits of educational projects which are intangible from measurement points of view make benefit cost ratios worthless? Does the coefficient of ignorance, as Balogh and Streeten call it, reduce them to what they describe as 'sordidly mercenary approach' for influencing policy-decisions?[64]

It is hoped that a careful consideration will be given to all these issues before suggesting the application of benefit-cost analysis for the evaluation of educational projects.

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[62] *Ibid.*, P. 700.

[63] Burton A. Weisbrod, *Economics of Public Health*: *Measuring the Economic Impact of Diseases*, Philadelphia, University of Pennsylvania Press, 1960.

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Chapter Thirty-Two

Problems Involved in Measuring Cost, Efficiency and Productivity of the Indian Educational System

C. B. PADMANABHAN

This paper examines some of the problems involved in measuring the cost, efficiency and productivity of the Indian educational system. It is a little difficult to speak of the Indian educational system because of its variations in the different States of India. Therefore, it may be necessary to have a look at the system in an aggregate manner for certain purposes and go behind to the level of institutions run by the local authorities in rural areas for other purposes. Attention is confined to the formal system of education, but the concept of productivity is widened to include the ability of the educational system to bring about the changes in the productivity of the economy and also in the attitudes and motivations needed for accelerating rapid economic growth.

We can measure the cost, efficiency and productivity of the Indian educational system at a point of time or over a period of years. Obviously, the problems involved in both these cases are different. We may begin with the problems involved in measuring it at a point of time. But it will be noticed that it has not been possible to limit rigorously to this requirement and it has been necessary to look at the other problem of measuring the changes in productivity over a period of time.

We have to decide on the coverage of the state. We have to measure the cost, efficiency and productivity for different levels of education, for types of institutions by ownership and by location as to whether they are in rural or urban areas. We are sure to come across significant differences in regard to each of these sub-systems. Eventually, the idea is to measure the cost, efficiency and productivity of the educational system in its aggregate. One can imagine that the educational system is composed of a number of sub-systems and the overall efficiency of the system is reflected by the efficiency of the sub-systems.

It is, however, only partially true to say that the overall efficiency is merely reflected in the efficiency of the various sub-systems. The efficiency of the educational system, especially its external efficiency is influenced by a number of other factors.

Concept of Internal and External Efficiency and the Relationship Between the Two

By external efficiency is meant the ability of the educational system to contribute to the manpower required for economic growth and influence attitudes and motivations of the people in the direction of rapid economic growth. It would be useful to point out at this stage that there is no educational system or structure which is optimally related to a certain pattern or rate of growth of the economy. There are several difficulties in judging the efficiency of an educational system on this criterion because no such criterion exists. Even if there are such criteria it is difficult to decide efficiency on the basis of a certain criterion because there are other issues involved, like the political and administrative considerations which get reflected in decision making. Thus, from the political point of view, enrolment at certain level of education may have to go up. Of course, for India only enrolment in primary level is envisaged as an essential human right and even that is likely to be achieved only 20 years hence. Administratively, it may not be easy to bring about an increase in enrolment even if that is accepted as an objective. Therefore, any consideration of the efficiency of the educational system is bound to get mixed up with a judgement on decision making.

The internal efficiency of the educational system may be viewed as the capacity of the system to turn out graduates in the most efficient way. Wastage and stagnation which are found especially at the primary level in the developing countries are the most obvious instances of inefficiency in the educational system. But on a deeper consideration it may be found that they are due to lack of external efficiency that is, enough resources may not be flowing into a certain level and, therefore, the per pupil expenditure at that level may be low. As a result, very little is spent on ancillary services like mid-day meals or school uniforms or books. If the educational system has been more efficient in the external sense, the internal efficiency of the system also can be improved. In addition, in the developing economies the employment market is getting diversified and, therefore, the graduates of the educational system at any level have to consider and make a choice from the following three alternatives:

i. To continue education to a higher level;
ii. To seek employment as a teacher at a lower level; and
iii. To seek employment in the labour market, outside the educational sector.

It may be noted that the decision regarding each of the above matters is heavily influenced by the direction in which the economy is moving and in influencing which the educational system itself has an important role to play. This also brings out the interrelationship that exists between internal and external efficiency of the educational system.

The educational system has to face a number of limitations in its attempt to expand and they are stemming both from within the educational system and outside it. The limitations from within are those arising out of teachers with a required qualification and the students coming from one level who are willing to join the next higher level. The latter is not merely a matter of wastage and stagnation, it is also the result of the pattern of demand for education on the part of the people for a developing economy. The limitations coming from outside the educational sector are:

i. The expenditure on education which is decided, at present, mainly on the basis of political considerations; and
ii. Total population in the school going age which is the result of the demographic forces.

Therefore, it is necessary to point out that the separation between internal and external efficiency, though helpful for analytical purposes, cannot be considered rigorously.

The Variables On which Information to be Collected

In any measurement of efficiency it is necessary to have information on the following:

i. *Teachers' Salaries.* The major item of recurring expenditure is teachers' salary and normally it reflects the qualifications and experience of teachers and these have an important bearing on productivity. Therefore it is necessary to have information on teachers' salary by levels and by types of qualifications and by regions in the country.
ii. *The extent of trained teachers available at different levels.* Often there is a desire to promote enrolment by relaxing rules regarding training requirements. This is bound to have an important impact on efficiency. Hence, it is necessary to analyse the composition of teachers in terms of the training that they have completed and look at the trend over the relevant period in all levels of education. In particular it is necessary to examine whether the instances of drop-out has anything to do with the training received by the teachers.
iii. *Teacher-pupil ratio.* Usually, average teacher–pupil ratio is taken into account. But there are variations from one region to the other. It is necessary to analyse the teacher-pupil ratio by regions and also by the kind of teachers in terms of their qualifications. Perhaps, it may be found that with a trained teacher the ratio can be higher than in the case of

untrained teachers. These variables have to be analysed separately for residential schools and non-residential ones and also by types of management like government, local authorities or private bodies.

iv. *The demand for educated labour.* Sometimes it may seem that availability of employment opportunities in the concerned region itself contributes to the improvement of productivity especially for technical and vocational education. Of course, one does not know what the actual position is in this matter because in a State like Kerala employment opportunities are meagre and it is worthwhile enquiring what has been its impact on the educational system. It is found that there is very little wastage in Kerala and, therefore, the position in other States of India have to be examined.

Problems of Measurement of the Internal Productivity of Education

The usual method of measuring the products from the educational system is to find out the number of pupils in the various categories during and at the end of the period. We can distinguish graduates from those who do not complete the cycle or drop out of the system. Graduates at the end of the cycle can be calculated from the published figures. But the drop-outs A in the *i*th class is equal to the difference between the number enrolled in this class and the total qualifying from it enrolled in the next class. The drop-outs at the end of the six year cycle is calculated in the following way:

$$A\,(1{\cdot}6\;t_o) = E\,(1{\cdot}6\;t_1) - E\,(1.6\;t_1) + P\,(1{\cdot}t_1)$$

where

$E\,(1{\cdot}6\;t_o)$ = Enrolment for a 6 year cycle at the end of a year t_o.
$E\,(1{\cdot}6\;t_1)$ = Enrolment for a 6 year cycle at the end of the year t_1.
$P\,(1,\;t_1)$ = New enrolments in the 1st year of the cycle in the year t_1.

The analysis of the output in education enables us to know how efficiently the internal system of education is functioning. The production of the educational system is the final product and it reflects the ultimate efficiency. However, every year there is a certain output or yield from a certain level which is the input for the next year. For measuring this internal efficiency we have to measure the internal flow. Enrolments are compared from one year to the next. This represents the rate of increase. The numbers in the final year of the school are compared with the numbers in the first year and this is called the apparent output rate. The promotions are compared with those of the previous year—the *promotion* rates. The number of promotions and repeaters in a class are compared with the total number of the previous year and this is the *retention rate*. The *retention rate* is thus equal to aggregate promotion and repetition rates. Real output refers to the number of units really graduated per unit of educational time.

We can also measure the nature or the quality of the graduates by trying to find out (i) whether the pupils leaving the school have reached the level required by regulations in the matter (of course if they exist); (ii) if not what level have they reached in relation to this optimum or to other examinations whose level is known; and (iii) in relation to those graduating what level has been reached by pupils who drop out during the school. The marks obtained by pupils give indication on the above matters but this assumes a uniformity about examinations and this has to be examined.

Problems of Measurement of Cost

We have already indicated that the cost items on which data are to be collected are the teachers' salaries, non-teacher's costs like administrative expenditure and capital costs. Such costs for different levels and types of schools have to be collected and per-pupil cost on account of teacher cost, non-teacher cost and capital cost have to be calculated. The per-pupil cost has to be collected for the different methods of teaching adopted in various schools, for schools of different sizes, for schools in rural and urban areas, for the different levels of qualifications of teachers, for different types of education and for different points of time. Calculations of per-pupil cost and investigations of the causes for their variations are themselves bound to reveal important insights regarding the efficiency and productivity of the educational system.

At this stage, it is necessary to point out that the money cost is used as a measure of the educational effort in the absence of a common physical unit which will take into account such a wide variety of inputs like the time and energy of the teachers and administrative staff and the pupils, the books and other materials used in educational process and the equipment and buildings. The prices of these items would have changed in different ways over a period of time and also all these items of inputs are not of the same importance for education. It, therefore, becomes necessary to identify the magnitude of each of these items at a point of time and measure the productivity of each of these items at a point of time, it is necessary to construct an index for all these inputs with a suitable weightage for each and price level index which is also to vary from region to region.

Problems of Measurement of Productivity

The productivity is relationship between the input and output of the educational system. More specifically it is the output per unit of input into the system. We have enumerated the complexities involved in the measurement of inputs and outputs and they go to show the difficulties involved in measuring the productivity. The measure of the external productivity is particularly difficult as the objectives are neither explicitly stated nor recognized. In so far as they are identifiable, it is possible to work with a number of indices. The earnings of those going out of the educational system in different occupations will give an index of the economic criterion of quality. We can also examine whether the tendency to study in this school system has become stronger and work out an index on the basis of length of schooling. It is also possible to work out with an academic index taking into account the improvement in academic standards that might have taken place.

Relationship Between School Size and Cost

One important area for investigation in cost, efficiency, and productivity is the relationship between the size of the schools or colleges, and the cost per-pupil in such institutions and their relationship to productivity. It has been found that small institutions have got high per-pupil costs and from the purely economic point of view it may not be worthwhile to have such institutions, especially if they are also turning out products of inferior quality. If it is so then there are different economies of scale in the operation of schools. But the evidence in this matter is conflicting. Certain studies have found a negative correlation between the size of the schools and per-pupil expenditure. In an analysis employing multiple correlations and regression it was found that there was no significant economies of scale; therefore, combination of small schools will not be in any way solving the problem of high per-pupil cost. (A study of Hirsch.) But a report on the Irish education system found that smaller schools were more expensive. In terms of participation pupils of smaller schools made lower progress at primary levels and the range of choice available for the pupils was limited (a report of the Irish Educational System). Therefore, it is necessary to investigate the relationship between the size of the schools, the cost and the productivity in such schools. It is necessary to decide beforehand whether we are going to concentrate on individual schools and their size and cost and investigate the quality of their products, or on schools in a certain locality which are found to have common characteristics.

The Efficiency in Regard to the Tapping of Finances

The support for education by the Government is now taken for granted. It is necessary to investigate whether the finances required for this purpose are raised efficiently and whether there are possibilities of enhancing these, say, by mobilizing popular enthusiasm or by adopting certain commercial practices like the issuing of bonds. There is also the ethical or the equity aspect of it. In an economy where income distribution is becoming unequal, is it fair for education to be made available in the way in which it is being done at present? At higher levels of education, should there not be a kind of self-financing like dependence on fees and loan scholarships? There should be a distribution of the burden of financing of education between the community and the government. The community share of the per-unit cost should vary inversely with income. Of course, this will apply only to secondary and higher levels of education because the provision of free and compulsory primary education is the responsibility of the State.

Other Difficulties in Measuring Productivity

There are two other matters to be taken into account while measuring the external productivity. They are relating to the migration of educated population and the consequent loss of benefit to the concerned region and inter-dependence with health expenditure. In rural areas expansion in education leads to the migration of the educated labour into urban areas and rural areas are deprived of the benefit of educated labour. While measuring the productivity in the external sense it is necessary to find out to what extent this kind of migration is taking place and, of course, when measuring the productivity of education in urban areas the extent to which it is due to migration has also to be investigated. Therefore, it is necessary to study the pattern of migration and the levels of education. The other is that arising out of the interdependence between education and health at the early stage of development of an area. Certain studies have shown that countries which rank high in the health field usually also rank high in the educational field and vice-versa (U.N. Research Institute for Social Development). It is necessary to take into account the interdependence between the two while measuring the productivity in certain backward areas in India.

An Analysis of Sources of Inefficiency

Whatever be the criterion we adopt for measuring efficiency we can have a close look at the possible source of inefficiency and test whether there is inefficiency at all and whether the source of this can be removed. We can examine the way in which the targets for educational development are set in every State or local authority's jurisdiction and whether the subsequent actions are in conformity with the attainment of these targets. We can also examine whether there are possibilities of improving the process of education. For this purpose many research findings from social sciences could be incorporated in policy making. In addition, in every locality one can examine whether the most intensive use of all the factors consumed in education is made. For example, there may be unutilized capacity available or even teachers whose services are not fully and properly utilized.

Conclusion

The object of this paper has been to draw attention to the various problems involved in an attempt to measure the cost, efficiency and productivity of the Indian educational system. The need for an analysis on these lines can hardly be denied in the context of the Indian educational system in which literacy is only about 30 per cent and the attainment of free and compulsory primary education is to be an accomplished fact only 20 years hence according to the calculations of the Indian Education Commission. The limitations of information on cost as they exist at present have already been referred to. On the question of measurement of productivity or benefit the information is much less and the difficulties of measuring the benefit have also been referred to. For investment decisions in social programmes like education and health there is need for cost-benefit analysis. But education is not a mere social service. Its nature as an investment has become increasingly evident and, therefore, the nature of inputs going to education has to be examined in detail. Since many inputs are used and the benefits are not measurable a kind of systems analysis has been suggested. Under this method the output and the input chosen for study will depend on the specific problem to be dealt with. This method can be used for improving the allocation of funds to education and also to decide how the additional funds can be used to the maximum advantage.

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Indian Year Books on Educational Planning Administration and Finance

(*under preparation*)

The NCERT has brought out year books on different aspects of educational development in India during last few years. So far, three year books have been published: (i) A Review of Education in India, 1947-61; (ii) Elementary Education in India; (iii) The Educational Research in India. To assist the NCERT in planning and production of a series of year books on educational planning, administration and finance an Advisory Committee, under the chairmanship of Prof. J. P. Naik, Adviser, Ministry of Education, Govt. of India, has been set up. The Advisory Committee has planned for four year books. These are: (a) *Educational Finance in India*; (b) *Educational Planning in Indian States*; (c) *Educational Administration in India*; and (d) *Educational Planning in India*. The Committee has so far finalised the overall design of the three year books.

An attempt will be made in these year books to discuss different aspects of the problems on the basis of research findings and a cool dispassionate analysis of the situation. Main emphasis in the year books will be on high-lighting major issues on suggesting some new and untried ideas which are likely stimulate debate and identify critical factors that are at present causing mal-adjustments between education and economy.

The approach for preparation of year books is problem based and cuts across different stages and sectors of education. Sometimes there may not be uniform solutions to many of the educational problems in a large country like ours where conditions vary from state to state and while dealing with these problems the contributors to the year books are to draw upon the experience and judgements of experts covering the wide range of different situations.

It is also proposed to conduct separate case-studies for different states and certain groups of union territories by the experienced and competent educationists. The findings of the contributions on different problems in these year books are expected to be helpful in the process of decision making in the field of educational planning at national, state and district levels.

A Study in Costs of Education in India

(*under finalisation*)

A Study in Costs of Education in India, 1950-60 is one of the nine major research projects of the NCERT. It surveys growth in the volume of educational expenditure during the decade and studies changes in the allocation and distribution pattern of educational finance according to different programmes and sectors of education. State wise various in cost per pupil, teacher salaries, priorities according to different stages/levels of education etc., are analysed.

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